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RETINAL DETACHMENT AND ITS TREATMENT BY SURGICAL METHODS

A Review of Four Hundred and Twenty-Five Cases

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INTRODUCTORY

THIS paper is based upon a study of the 425 cases of simple detachment of the retina admitted to the in-patient wards of the Royal London Ophthalmic Hospital between December 25, 1929, and January 7, 1933, a period of three years and fourteen days. From the commencement of this period until February 13, 1932, all cases were operated upon by cautery puncture; in the following six and a half months the majority were subjected to the Guist-Lindner method of multiple trephining; since August 26, 1932, all cases have been operated upon by diathermy following the technique of Larsson. Two hundred and twenty-one cases were operated upon by cautery puncture; a multiple trephining operation was performed on 79, a figure which includes 16 cases operated upon previously by Gonin's method; in 72 cases diathermy was used, five of the subjects having been operated upon before by cautery puncture, four by the Guist-Lindner operation and one by each of these methods. In 79 cases no operative measures were employed. It is the purpose of this paper to subject this large series of cases to analysis, and to compare operative results obtained by the methods of cautery puncture, multiple trephining and diathermy.

The Four Hundred and Twenty-five Cases

In this series 260 of the patients were males and 165 females. Their average age was 42·8 years, the youngest being a boy of eight and the oldest a woman aged 82 years. The cases have been divided into five refractive groups; namely, high myopes, intermediate myopes, low myopes, aphakics and emmetropes. Ninety-three cases had a myopia of over 10 dioptres, 86 a myopia of from 5-10 dioptres, 86 a myopia of less than 5 dioptres, 28 occurred in aphakic eyes and in no fewer than 132 cases the refraction was either emmetropic or slightly hypermetropic. The right eye was affected in 195 cases, the left in 168 and in 62 there was a detachment in each eye. Of the latter, 40 were cases of myopia showing an antecedent detachment in the other eye, nine occurred in aphakic subjects five of whom were previously myopic and four emmetropic, in four there was a condition of emmetropia—two of which had a traumatic detachment in each eye, whilst in nine of the cases there was a bilateral symmetrical detachment of the retina showing the clinical features which I described to the Ophthalmological Society of the United Kingdom last year (Vol. LII, p. 170). The above statistics are shown in the following table, the figures being expressed as percentages in the second column:—

TABLE I

General Statistics

			Per cent.		
Males	260		61·2		
Females	165		38·8		
Average age	42·8		42·8		
High myopes (over 10 D.)	93	265	21·9	62·3	
Intermediate myopes (5–10 D.)	86		20·2		
Low myopes (0–5 D.)	86		20·2		
Emmetropes	132		31·1		
Aphakics	28		6·6		

Trauma, direct and indirect, appears to have played a small part in the aetiology of the myopic detachments and, as might be expected, has occasioned a much larger proportion of those occurring in emmetropia. Thus in the group of 265 myopes a history of recent local or general injury was obtained in 41, a percentage of 15·5, whereas in the 132 emmetropes direct or indirect trauma played a part in 58, a percentage of 43·9. In addition, in one of the emmetropes, two of the aphakics and six of the myopes the onset of detachment synchronised with a bout of severe coughing; in two of the high myopes it occurred when lifting a heavy weight, and in one of the low myopes whilst playing golf.

The influence of injury in the aetiology of retinal detachment is shown graphically in Diagram I, in which the ever decreasing importance of trauma as the degree of myopia increases is well demonstrated. The figure also shows that the moiety of direct, or

DIAGRAM SHOWING THE INFLUENCE OF TRAUMA, DIRECT AND INDIRECT, IN THE AETIOLOGY OF RETINAL DETACHMENT.

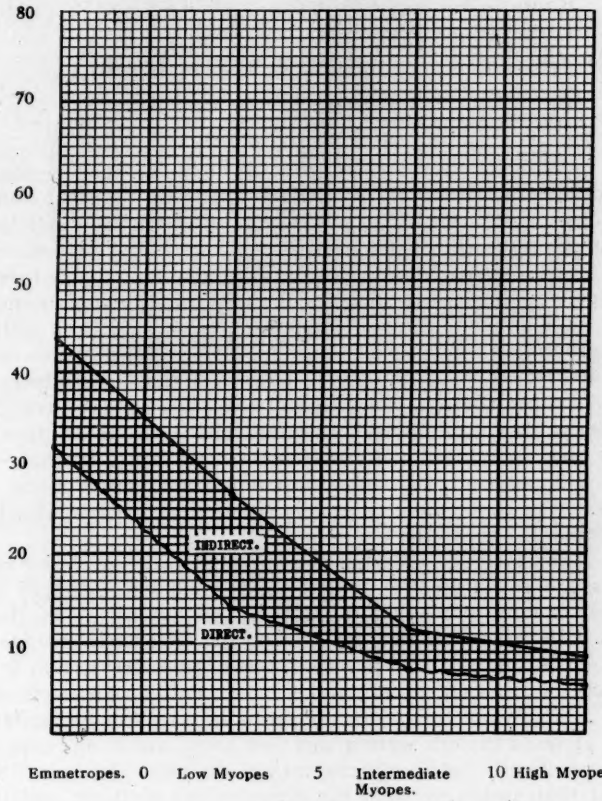

DIAGRAM I.

more severe injury, is of relatively still greater significance in emmetropia than is the element of indirect, or less severe trauma, and it decreases proportionally more rapidly than does the latter as the measure of myopia increases. Spontaneous detachment is therefore the rule in myopia, trauma of relatively frequent import as an aetiological factor of retinal detachment occurring in emmetropia.

Retinal Holes—Distribution and Incidence

In this series a retinal hole or holes were found in 324 cases, a percentage of 76·2. Of these 90·4 per cent. were in front of the equator of the globe, and in 23·8 per cent. of the cases the holes were multiple. According to their morphology retinal holes may be classified into five groups, namely,

(1) Round holes.
(2) Disinsertions at the ora serrata.
(3) Arrow-head or horse-shoe-shaped holes.
(4) Slit-like tears.
(5) Irregular rents.

The typical round hole is definitely circular, has a sharply punched-out outline, varies in diameter from less than 0·1 mm. up to that of the disc itself and is not infrequently associated with foci of old choroido-retinitis, suggesting that this type of hole is inflammatory in origin. Oval, triangular and diamond-shaped tears together with degenerated fenestrated areas of the retina in which numerous minute rounded or honeycomb holes are present have been included in this group and so classified as rounded holes. The holes in this rather heterogeneous group are commonly multiple, this being the case in 22·6 per cent. of their incidence in this series; in addition in 13 per cent. the round hole was combined with one or other type of true hole, in 9·6 per cent. with fenestrated areas in the retina, and in 5·2 per cent. of this group fenestrated areas alone were present. The round hole is usually situated at a point about two disc diameters behind the ora serrata.

The disinsertion, or, as it is more correctly called, anterior retinal dialysis, a term suggested by Ringland Anderson, averages about 5·1 mm. in long axis—that is, subtends an arc of 30° at the ora serrata. In this series 58·7 per cent. of the disinsertions subtended an arc of 30° or less, 25·6 per cent. one of from 30° to 60°, 9·1 per cent. one of from 60° to 90°, and 4·1 per cent. an arc of from 90° to 180°. In two of this series the retina of half the circumference of the globe at the ora serrata was torn away and in one case there was a practically total anterior retinal dialysis. In only 7·4 per cent. of their incidence were the disinsertions multiple, and in 3·3 per cent. they were combined with other holes.

The arrow-head and horse-shoe holes are shaped as their names indicate, the point of the arrow or convexity of the horse-shoe being nearly always on the disc or central side of the base of the arrow-head or concavity of the horse-shoe. The peripheral tag of retina so delimited is frequently seen to project into the vitreous, suggesting the possibility of vitreous adhesion and traction in the genesis of

PLATE 1.

Retinal detachment in the right eye of a high myope (−20 D.) showing a horse-shoe-shaped hole combined with a radial slit-like tear in the supero-nasal quadrant. Appearance six weeks after the commencement of visual failure. The sub-retinal fluid has gravitated downwards, leaving the retinal holes on an apparently attached portion of the retina. Note the projection of the retinal tag into the vitreous.

PLATE 2.

Retina pulled into the form of a cone infero-temporally by the coagulation and contraction of the vitreous following cautery puncture for a slit-like tear in the supero-nasal quadrant. Appearance six weeks after operation (semi-diagrammatic). A year later an irregular retinal hole was present at the site of the apex of the cone, and the vitreous strands had largely disappeared.

this type of rent. Averaging about 3 mm. from apex to base, the arrow-head hole tends to be large, its centre is usually situated about three disc diameters from the ora serrata and it is most frequently single, in this series being combined with other types of retinal hole in 13·3 per cent. and multiple in only 5·7 per cent. It is this type of retinal tear which in my experience is most frequently crossed by an intact retinal vessel which usually traverses the rent on a narrow "bridge" of retinal tissue. The resistance offered by the larger retinal vessels to hole formation is thus aptly demonstrated. That, in rare instances, one of the larger vessels may rupture at the moment of retinal hole formation, is shown by the fact that three of the cases in this series presented themselves clinically as examples of total spontaneous vitreous haemorrhage, the detachment and hole only being discovered some months later on the vitreous clearing. A lesser haemorrhage is probably of fairly frequent occurrence and may account for the coarser vitreous opacities which are practically a constant concomitant of simple retinal detachment. (Plate 1.)

The slit-like tears are usually small, their long axis is characteristically parallel to the meridian of the globe at that point and they are situated about a disc diameter and a half behind the ora. In 10 per cent. of their incidence in this series they were multiple, and in 20 per cent. combined with other holes. It is worth pointing out that the limbs of an arrow-head or horse-shoe rent may be mistaken for two radial tears, the point of the arrow or convexity of the horse-shoe being hidden behind the retinal tag or a secondary fold of detachment.

In the group of irregular holes have been placed those rents which could not be classified under the above headings. This type of hole is definitely associated with trauma, and therefore tends to be large, irregular in outline, and variable in position. In 10·5 per cent. of its incidence it was multiple, and in 26·3 per cent. combined with one or other type of retinal tear.

The distribution of the three chief types of retinal hole,—round, arrow-head and disinsertion, is shown in Diagram II. For the purpose of this figure each eye has been numbered as if it were a clock face, the left eye anti-clockwise so that corresponding retinal points should be obtained. In a given eye multiple holes of the same type occurring in one sector have been classified as a single hole, and tears placed on the boundary between two sectors have been included in the sector adjacent in which they show their maximum incidence. Grouped in this way there were 115 examples of the round hole, 113 of the disinsertion, 105 of the arrow-head, 20 of the radial slit-like tear, and 19 of the irregular rent.

A glance at this diagram shows that the temporal half of the globe is by far the commonest site for a retinal hole, 79·6 per cent. of all tears in the series occurring in this situation. The infero-nasal is

DIAGRAM SHOWING THE DISTRIBUTION OF THE THREE CHIEF TYPES OF RETINAL HOLE.

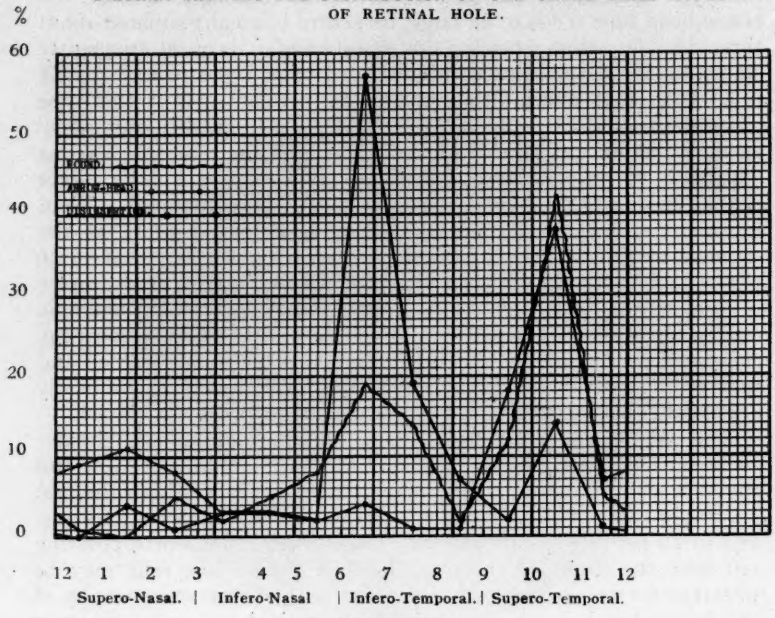

DIAGRAM II.

the quadrant in which a retinal hole is least commonly found, but a retinal detachment, of course, occurs here frequently as the sub-retinal fluid tends to gravitate downwards; hence the supero-nasal quadrant becomes the situation in which the retina is most likely to be found *in situ*. It is in the temporal half of the globe that the round hole has its main incidence, 82·6 per cent. occurring here, with 51·3 per cent. in the supero-temporal quadrant which is the site of election for this type of hole, its "peak" being in the sector 10-11. The disinsertion also occurs chiefly in the temporal half, but with this type of rent the infero-temporal quadrant is the site of election, 73·5 per cent. being located here, a marked "peak" occurring in the sector 6-7. The curve for this type of hole shows a small secondary rise in the sector 10-11; the majority of the anterior retinal dialyses occurring in the upper temporal quadrant have, in my experience, been associated with severe direct trauma to the eye. The arrow-head and horse-shoe holes were situated in the upper half of the globe in 86·6 per cent. of their incidence, and in the supero-temporal quadrant, their site of election, in 60 per cent. The sector in which they show their maximum incidence is, as with the group of rounded holes, that from 10-11. The slit-like and irregular rents were also

distributed chiefly in the temporal half of the globe, 80 per cent. of the former and 89·5 per cent. of the latter being in that situation. A small "peak" occurred for the radial slits in the sector 8-9, and from 10-11 for the irregular rents.

In Diagram III is shown the percentage incidence of the various types of retinal tear in the four main refractive groups, the class of aphakics being considered according to their refraction before operative removal of the lens. For the purpose of this diagram multiple holes of the same class occurring in a given eye have been regarded as a single example of the hole in question. Numbered in this way it will be observed that the round hole shows its main

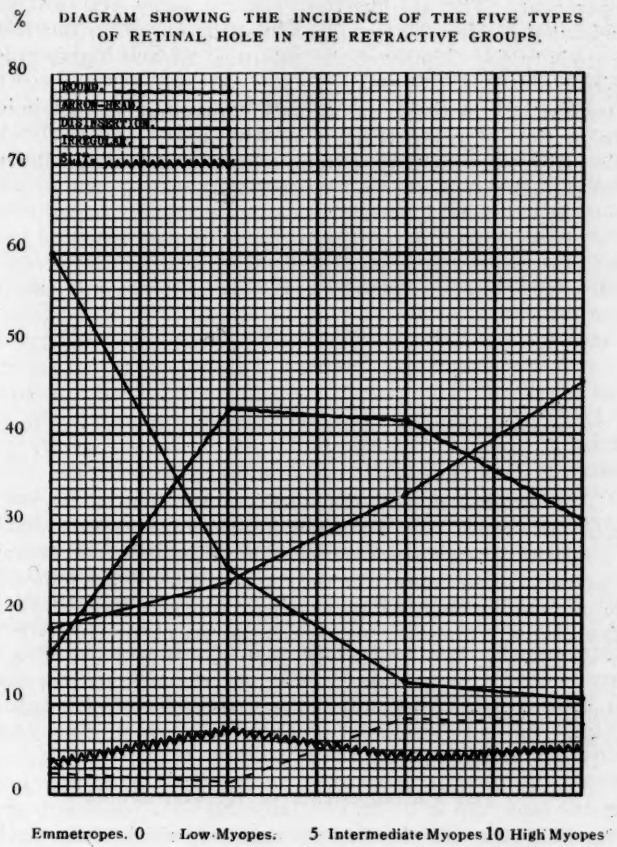

DIAGRAM III.

incidence in the groups of low and intermediate myopes, in each of which it forms just over 40 per cent. of the tears, its curve falling steeply to 15·7 per cent. in the emmetropes, and more gradually to 30·3 per cent. in the class of high myopes. The curve for the arrow-head and horse-shoe-shaped rents shows a steady rise from 18·3 per cent. in the emmetropes to 45·8 per cent. in the high myopes, in which group it therefore becomes the retinal hole of most frequent occurrence. The disinsertion, on the other hand, is present chiefly in the emmetropic or slightly hypermetropic eye in which it forms no less than 60 per cent. of the tears, its curve then showing a steady decline throughout the range of myopia, until, in the group of high myopes, its incidence has fallen to only 10·8 per cent. The slit-like rents show a fairly even distribution throughout the refractive groups, whilst the curve for the irregular rents tends to rise slightly in the intermediate and higher grades of myopia.

Some further statistics of interest concerning retinal holes are shown in the following table in which the age and sex incidence together with the influence of trauma have been worked out for each type of retinal tear.

TABLE II

	Males Per cent.	Females Per cent.	Average age Years	Trauma Per cent.
Round ...	47·2	52·8	45·3	16·0
Arrow-head...	57·7	42·3	52·0	18·5
Slit	52·9	47·1	51·3	23·5
Disinsertion	70·3	29·7	31·1	39·0
Irregular ...	88·2	11·8	41·0	58·8

It is of interest to note that those rents which occur mainly in myopia—the round and the arrow-head—show a fairly equal sex, and a relatively late age incidence, whilst the influence of trauma is not marked. The figures for the radial slit-like tears follow closely those of the arrow-head type which suggests that they share a similar origin. The disinsertions, however, occur chiefly in males, at an earlier age, and a relatively high percentage are of traumatic origin. The irregular rents, in which the influence of injury is undoubted, naturally show a decided preference for those of the male sex.

The Pathogenesis of Retinal Holes

The following are the factors each of which may, in theory, determine the formation of a retinal hole—

(1) Trauma, direct or indirect.

(2) Degeneration, detachment and traction of the vitreous body.

(3) Focal retinal necrosis from acute choroido-retinal inflammation.

(4) Retinal degeneration.

It is, perhaps, unwise to draw conclusions regarding the pathogenesis of retinal holes from statistical evidence alone. It has been shown, however, that the arrow-head and horse-shoe rents occur in the upper half of the globe in 86·6 per cent., and present a rising curve of incidence as the degree of myopia increases. It is difficult, therefore, not to come to the conclusion that this type of retinal hole clinically agrees well with Gonin's conception of the origin of retinal tears—that is by the traction of degenerate vitreous stroma which has become anchored to a small area of retinal tissue through the action of a pre-existing inflammatory focus. The round holes, on the other hand, show neither the same preference for the upper half of the globe nor for the higher degrees of myopia, but are distributed mainly in the temporal half of the globe and in the low and intermediate grades of myopia. Although the rather uncommon rounded hole in which an isolated portion of retinal tissue appears to lie free in the vitreous in front of its centre probably has a similar origin, the sharply punched-out, definitely circular hole which is often associated with scattered foci of old choroido-retinitis is almost certainly derived from the breaking down of adhesions or a tearing of the retina around such an inflammatory focus. The single round hole in which the eye shows no evidence whatsoever of any previous inflammatory lesion in all probability results from the rupture of a retinal cyst. The small, multiple rounded holes which are usually contiguous and the atrophic fenestrated areas of the retina would appear to be the result of a simple primary retinal degeneration and it seems unlikely that the vitreous plays any active part either in the formation of these holes or in the ensuing detachment.

The disinsertion occurs mainly in emmetropic eyes and in the infero-temporal quadrant. A history of trauma is obtained in about 39 per cent. of the cases having this type of rent. In a proportion of these, no doubt, no factor other than that of direct violence is required, a delicate tissue yielding at its weakest point, close to its periphery and in its most exposed situation. In the remainder, and in the still larger number in which no history of injury is obtained, additional factors must be sought. The periphery of the retina is thinnest on the temporal side and it is here that the retina is earliest affected by cystoid degeneration. Two anterior retinal dialyses in this series were secondary to an inflammatory retinal

detachment, the sub-retinal exudate spreading inferiorly under the influence of gravity, lifting the retina from its bed and tearing it at its weakest point as a stamp is torn along its perforations. Ringland Anderson states that "the actual cause of anterior dialysis, apart from obvious cyclitis and severe trauma, is obscure. Structural features, and particularly the attachment of the vitreous base and the 'stretched' nature of the inferior temporal ciliary zone, appear to play a part in the mechanism that may produce dialysis. One has only to watch the development of a tear round a retino-vitreous adhesion or to see the alteration in shape and position of a hole in a posterior hyaloid membrane after cauterisation to realize the effect that vitreous traction may have on the retina. Such traction is particularly potent near the ora serrata owing to the firm attachment of the vitreous base. Once the pars ciliaris retinae and the ora serrata are torn from the retina by the adherent base of the vitreous, the retina lies loosely, and almost un-attached, on the choroid until the collection of fluid beneath it causes its detachment. Such a separation may be aided by the presence of cystoid degeneration which appears most early in this apparently predisposed zone."

The majority of the irregular rents are undoubtedly due to the effect of direct violence; the remainder probably result from the further splitting up of the retina along one or both limbs of an arrow-head rent, this type of hole taking on many diverse and bizarre shapes when the degree of myopia is high and the retina unduly atrophic.

From a consideration of the foregoing it would appear possible to classify simple detachment of the retina into four clinical types:—

(1) Detachments occurring in early life, more especially in the second and third decades. In these about 70 per cent. are in males; the refraction is typically non-myopic, and rather more than one-third are of traumatic origin. The detachment, which tends to be flattened rather than ballooned, commences below in relation to an anterior retinal dialysis situated in the lower temporal quadrant, and many show a marked tendency to become circumscribed by a zone of choroido-retinal adhesions, and hence remain stationary for long periods. A complicated cataract does not appear to develop unless the retina has become totally detached. As a sub-group of this class should be included those cases of bilateral symmetrical detachment of the retina, which I described in a previous paper, in which symmetrically placed disinsertions are present infero-temporally.

(2) Detachments commencing in later life, more especially in the fifth and sixth decades. In these the sexes are more equally affected; the refraction is typically myopic, chiefly of the intermediate and higher degrees, and trauma is of small significance in

the aetiology. The detachment, at first frequently ballooned, commences above in relation to an arrow-head or horse-shoe rent situated usually in the upper temporal, less frequently in the upper nasal quadrant, and, as a rule, spreads rapidly until the retina is totally detached, a complicated cataract developing within six to eighteen months and soon becoming complete.

(3) Detachments primarily inflammatory in origin but becoming of the simple type secondarily through the sub-retinal exudate lifting and tearing the retina at its weakest part, pathologically or otherwise, or possibly breaking down choroido-retinal adhesions around a previous focus of acute choroido-retinitis, or tearing the retina at the periphery of such a focus, and thus perpetuating the detachment by forming a direct communication between the pre- and sub-retinal spaces. Two of the detachments in this series were undoubtedly of this nature, and, as previously mentioned, a proportion of the true round holes may originate in this way, the remainder resulting from the rupture of a retinal cyst or from a simple degeneration of the retina. Detachments showing round holes occur mainly in the fourth and fifth decades, equally in the sexes, and in any type of eye, but more especially those with a low or intermediate degree of myopia. The detachment commences characteristically in the temporal half of the globe in relation to a round hole or holes situated most commonly in the supero-temporal, rather less commonly in the infero-temporal, quadrant.

(4) Detachments occurring in aphakia. In this series 19 were present in males and 9 in females. Thirteen followed cataract extraction at an average interval of 3·8 years and 15 after needling at an average interval of 25·1 years. These detachments are characterised by the relative rarity with which a retinal hole is found, in only 32·1 per cent. in this series; on account of this and the difficulty of accurate localisation when a rent is discovered owing to the altered refractive conditions, and also the frequency with which the periphery of the fundus is inaccessible to ophthalmoscopy because of remnants of posterior capsule, the operative prognosis is consistently bad.

Localisation of Retinal Holes

At Moorfields direct ophthalmoscopy is employed in the search for, and localisation of, retinal holes. With an intelligent patient an accurate account of the initial symptoms, photopsiae or positive scotoma, especially with regard to their position in the visual field, are of the utmost value as indicating the original position of the detachment and hence that of the retinal tear. The hole need not necessarily be found on that portion of the retina which is detached at the time of examination as the sub-retinal fluid in relation to a

detachment commencing above usually gravitates downwards, so that, in a detachment of some chronicity, the hole may be found on a flat, or apparently attached, portion of the retina. The tear may be hidden behind a large balloon or secondary fold of detachment, in which case it may sometimes be revealed by keeping the patient recumbent for a few days in an appropriate posture, or the subretinal fluid may be evacuated by a posterior scleral puncture. A posterior sclerotomy for this purpose was performed in nine cases of this series with the subsequent discovery of a hole in two.

The retinal hole having been located, it is necessary to calculate its distance from the ora serrata and to mark the meridian passing through its centre. The ora serrata is assumed to be visible to ophthalmoscopic examination when, with the pupil fully dilated, the eye is rotated as far as possible in the required direction. In an emmetrope or an eye with a low degree of myopia it lies at a distance of about 8 mm. from the limbus, in the intermediate and higher degrees of myopia, 9 mm. is allowed for this measurement; in all 1 mm. less is allowed for the nasal as compared with the temporal side of the globe. The diameter of the optic disc is 1·5 mm. and 1 D.D. (disc-diameter) is the conventional unit of measurement in fundus topography, the site of the retinal hole being calculated in terms of disc diameters from the ora serrata. To mark the meridian upon which the hole lies, a drop of a 2 per cent. solution of holocaine and adrenalin is put in the affected eye, and a pigment mark tattooed with Indian ink at the limbus on the side remote from the retinal hole but in the same line as this and the centre of the cornea. The ophthalmoscope is then employed to determine whether the mark so made, the centre of the cornea and the hole are in correct alignment. If this is the case a second mark is tattooed at the limbus at a point diametrically opposite the first. At operation a guiding thread of silk is knotted at the site of the first pigment mark, passed over the centre of the cornea and the second pigment mark so that its prolongation crosses the site of the retinal hole; the previously estimated distance of the latter from the ora serrata—added to the 8 or 9 mm. allowed for the distance from limbus to ora—then being measured off along the guiding line with a pair of calipers. Having thus ascertained the surface marking of the retinal hole, this spot is marked on the sclera by a touch of the actual cautery or by one or two turns of a 1·5 mm. trephine.

Cautery Puncture

At Moorfields the first operation for retinal detachment by Gonin's method was performed by Sir William Lister on December 27, 1929. Since that date and until this type of operative

procedure was superseded by that of multiple trephining and diathermy, 221 cases were so treated; 204, in which retinal holes were discovered, by a true Gonin operation, and 17 cases, in which no rent was found, by the so-called "blind" cautery puncture. It is outside the scope of a paper such as this to describe the details of Gonin's operation, suffice to say that Gonin's technique was followed exactly for the first six months when the somewhat fickle Paquelin cautery was replaced by the electric thermo-cautery with a consequent fall in the incidence of late vitreous haemorrhage. The results obtained with this type of operation are shown in the following table:—

TABLE III

Cautery Puncture

	(204 cases) Holes present.				(17 cases) "Blind" operation.		
		Cure	Improved	Failure	Cure	Improved	Failure
Emmetropia - - -	(71)	24 (33·8%)	11 (15·5%)	36 (50·7%)	(4) 0	1 (25%)	3 (75%)
Myopia (0–5 D.) -	(40)	12 (30·0%)	4 (10·0%)	24 (60·0%)	(1) 0	0	1 (100%)
Myopia (5–10 D.) -	(44)	16 (36·4%)	4 (9·1%)	24 (54·5%)	(3) 0	0	3 (100%)
Myopia (over 10 D.)	(41)	8 (19·5%)	1 (2·4%)	32 (78·1%)	(6) 0	1 (16·7%)	5 (83·3%)
Aphakia - - - - -	(8)	1 (12·5%)	1 (12·5%)	6 (75·0%)	(3) 0	0	3 (100%)

Thus, of all cases operated upon by cautery puncture, 27·6 per cent. were cured and 10·4 per cent. improved, the figures for the true Gonin operation being 29·9 per cent. and 10·3 per cent. respectively, whilst with the "blind" cautery puncture no cases were cured and two or 11·8 per cent. showed improvement either in visual acuity or visual field or in both. The large majority of the cases which are the subject of this paper have been followed up, and, for all types of operative procedure, the results given are based upon the condition found on clinical examination during the first three months of last year. This accounts for the figures in the above table of the cases showing improvement being rather smaller than those given in my previous papers dealing with Gonin's operation, as it is only to be expected that a majority of the cases deriving some immediate benefit from operation, but without complete reposition of the retina at the time of discharge from hospital, would fail to maintain the improvement. Such cases, therefore, and also those of primary cure with later relapse have been classified as failures in this paper. By "cured" it is, of course, understood that the retina was completely in place at the time of examination.

The following table shows some further statistics of interest relating to the successes obtained by Gonin's operation.

TABLE IV

Duration of detachment	Cure Per cent.	Successes—number of operations	Per cent.
Under 6 weeks ...	40	One cautery puncture ...	62·3
6 weeks—three months	28	Two cautery punctures ...	31·2
3—6 months	22	Three cautery punctures...	4·9
Over 6 months ...	10	Four cautery punctures ...	1·6

The figures in the first column must be regarded as being approximate only as it has not been possible in every case to obtain an accurate history from the patient regarding the duration of visual failure. However, the figures show most graphically the importance of early interference when treating retinal detachment by operative means. In the second column is shown the number of separate cautery punctures performed upon the successful cases, the figures being expressed in percentages. It shows that the majority of the cures were obtained by one, or at the most, two cautery punctures.

Complications of cautery puncture, apart from the production of secondary rents and vitreous haemorrhage, were few. Thus, in the 221 cases so operated upon, 39, or 17·6 per cent., showed secondary holes, and 16, or 7·2 per cent., a complete vitreous haemorrhage. There were three examples of traumatic cataract, three of a diffuse sub-retinal haemorrhage, in one of which the development of a large opaque brownish mass beneath the retina suggested the diagnosis of thrombosis of a vorticose vein, whilst in one case the cautery point fused and was left in the patient's retina, where it produced a really remarkable ophthalmoscopic picture. In addition ten cases showed a transient uveitis characterised by slight chemosis of the ocular conjunctiva, ciliary injection, keratic precipitates, cells in the anterior chamber, retraction of the iris and hypotonia. The majority of these cleared up in the course of a few days on atropine and hot bathings, in fact two of the cases having this complication were ultimately discharged from hospital cured, so it does not necessarily militate against a successful result: on the other hand, in one case it led to seclusion of the pupil, iris bombé and secondary glaucoma for which an iridectomy had to be performed five months later. In two cases in which operation was followed by a complete vitreous haemorrhage, in one in which a traumatic detachment was complicated by subluxation of the lens, and in one case where the affected eye received a severe blow fifteen months after cautery puncture, secondary glaucoma supervened, the eyes became blind and painful and excision had to be performed.

Secondary rents, by which term is meant fresh defects in the retina following upon, and apparently a direct result of the operative procedure, are of three types:—

(1) Irregular rents at the site of the cautery scar, due either to a further tearing of the retina in the neighbourhood of the original hole by the trauma of the operation or to a condition which Lindner alleges is allied to necrosis produced by the thermo-cautery in the adjoining part of the retina.

(2) Traction rents, which may be of two varieties. *(a)* Holes, usually of an irregular shape, but occasionally assuming an arrow-head form, and characteristically situated at a point more or less diametrically opposite the site of cautery puncture, which are apparently due to coagulation and contraction of the vitreous towards the scar with a consequent pull on the retina. *(b)* Dialyses in the neighbourhood of the operation scar which seem to be produced by a mal-reposition and shortening of the retina which again results in traction towards the cicatrix. (Plate 2.)

(3) The extension of an anterior retinal dialysis. In a small proportion of the cases operated upon for this type of rent, the retina continued to tear away from the region of the ora serrata in the neighbourhood of the cautery scar. The mechanism would again appear to be imperfect re-application, shortening of the retina with consequent traction towards the cicatrix.

In the 221 cases operated upon by cautery puncture there were 20 examples of the first type of secondary hole, 14 of the traction rent—eight being traction disinsertions, and five cases showed an extension of an anterior retinal dialysis. In one case five weeks after an apparently successful operation the patient returned with an enormous secondary dialysis above, with the retina reflected and folded upon itself so that its choroidal surface was presented to view. The choroid alone was visible above, then the reverse aspect of the retina, and below, through the dialysis, a small portion of attached and normally detached retina was visible giving the patient a restricted, crescentic area of eccentric vision in the upper part of the visual field.

Multiple Trephining

The first operation by the Guist-Lindner method was performed at Moorfields on February 13th, 1932. Seventy-nine cases were operated upon by this means; in 57 of these retinal holes were found and in 22 a so-called "blind" operation was performed. Of the 57 cases in which retinal holes were present 13 had previously been operated upon by Gonin's method and three of the 22 cases in which no defects were discovered had been subjected earlier to a "blind" cautery puncture. The Guist-Lindner technique was closely followed, a 1·5 mm. trephine being used. In 12 cases, however, Foster Moore's modification was employed in which a single hole is made with a 2 mm. trephine, the choroid separated

around this area for a distance of about 5 mm. radius with a grooved, blunt-ended instrument shaped like an iris repositor, and phenol (acidum carbolicum liquefactum, B.P. 1914) applied with the repositor to the exposed and separated area of choroid; in one of the cases so operated upon 2 per cent. silver nitrate was used as the caustic agent. The main essentials of the Guist operation of multiple trephining are to obtain complete haemostasis before trephining is begun; to avoid perforation of the choroid until the requisite number of trephine holes has been made, and to leave uncompleted any trephined area which shows no tendency to stop bleeding. The points of exit of the vorticose veins should be borne in mind when trephining behind the equator of the globe and these areas avoided. The choroid must be fully exposed in at least one point in each trephine hole as it is useless to apply the caustic if an intact disc of sclera remains. A little solid cocaine applied to each area of exposed choroid before using the caustic was found helpful as the application of the caustic is very painful. With the exception of the cases mentioned above solid caustic potash was employed—the pointed stick being applied for about a second to each trephine hole and the excess immediately neutralised with a 1 per cent. solution of acetic acid. The operation is completed by perforating about a third of the number of trephined areas with a rather blunt-pointed instrument to evacuate the sub-retinal fluid and the wound then closed as in the case of a Gonin operation. As the operation, which is conducted under local anaesthesia, may last from one and a half to two hours, in apprehensive or restive patients an injection of omnopon gr. 1/3 and hyoscine gr. 1/100 an hour before operation was found advisable.

The results obtained with this type of operation are shown in the following table included in which are the 16 cases operated upon previously by cautery puncture: —

TABLE V

	Multiple Trephining (57 cases) Holes present.			(22 cases) "Blind" operation.		
	Cure	Improved	Failure	Cure	Improved	Failure
Emmetropia - - -	(16) 7 (43·8%)	3 (18·7%)	6 (37·5%)	(4) 2	1	1
Myopia (0–5 D.) -	(12) 1 (8·3%)	3 (25·0%)	8 (66·7%)	(2) 1	0	1
Myopia (5–10 D.) -	(12) 4 (33·3%)	1 (8·3%)	7 (58·3%)	(7) 1	0	6
Myopia (over 10 D.)	(15) 2 (13·3%)	0	13 (86·7%)	(7) 1	2	4
Aphakia - - - -	(2) 1 (50·0%)	1 (50·0%)	0	(2) 0	1	1

Of all cases operated upon by the Guist-Lindner method, 25·3 per cent. were cured and 15·2 per cent. improved, the figures for the cases in which retinal holes were found being 26·3 per cent. and 14·2 per cent. respectively, and for those in which no retinal defects were discovered 22·7 per cent. and 18·2 per cent. Of thirteen cases

having retinal holes and previously operated upon by Gonin's method, three, an emmetrope, one high myope and an aphakic were cured, and two, both low myopes, improved by a subsequent Guist operation, whilst in three subjects operated upon unsuccessfully by "blind" cautery puncture, one, an emmetrope, was afterwards cured by the caustic operation. It is only fair to the originators of this method to state that in seven of the cases the plan of operation was not carried through owing to early perforation of the choroid, if these cases, together with those operated upon by Foster Moore's modification in which one success was obtained, be excluded, the percentage of cures rises to 31·7.

In the 79 cases operated upon by these means, there were nine, or 11·4 per cent., examples of secondary rents and six, or 7·6 per cent., of a complete vitreous haemorrhage. In addition two cases had a moderately severe uveitis, two a vorticose vein thrombosis and one a diffuse sub-retinal haemorrhage.

The diagnosis of a vortex vein thrombosis was made on the appearance two or three days after operation of intense congestion with general chemosis and a complaint of aching in the eye. At first there was only a faint reflex; later the appearance of a solid-looking detachment but without any inflammatory signs, the congestion and chemosis, which lasted several weeks, appearing to be obstructive in origin.

Diathermy

There are two main methods of treating retinal detachment by diathermy, that evolved by Weve of Utrecht and that introduced by Larsson of Stockholm. At Moorfields the latter method has been adopted, the first operation by this means being performed on August 26, 1932, by Mr. E. F. King, the late Senior Resident Officer. Since that date and until January 7, 1933, which closes the period under review in this paper, 72 cases were so operated upon, a figure which includes 5 cases previously operated upon by cautery puncture in two of which the subsequent detachment occurred in the other eye, four cases operated upon before by the Guist-Lindner method, and one case which had been subjected to each of these types of operative procedure.

The apparatus used at Moorfields up to January 6, 1933, was a standard diathermy machine supplied by Messrs. Schall, the indifferent electrode being a lead plate and the active electrode a platinum wire 35 mm. long, 0·66 mm. in diameter, and bent in the centre at an angle of 130°. Subsequently an apparatus made by John Weiss and Son to the design of Frank Flynn has been used, and, as suggested by the latter, the surface of the sclera has been kept moist with distilled water during actual cauterisation whereby

charring of the surface of the sclera is avoided, and possibly a more constant effect on the choroid obtained. The operation is conducted under local anaesthesia, a sub-conjunctival and sub-Tenon's capsule injection of novocaine and adrenalin being given in the neighbourhood of the retinal hole. The exposure of the sclera and the careful marking thereon of the site of the retinal rent is conducted as in a Gonin operation, muscles being retracted or actually detached and re-inserted at the close of the operation should access not be sufficient without so doing. With the Schall machine the strength of current was so adjusted before the commencement of the operation that with the terminals of the apparatus short circuited, a reading of 1 ampère or slightly less was obtained on the meter. In the Weiss machine the milliampèremeter is a separate component and is connected in series with the active electrode, the current being so regulated as to give a reading of 60 ma. when the former is passing through the patient. In this apparatus the indifferent electrode is a perforated zinc plate which is applied to the forearm, perfect approximation being effected by the use of a special contact cream on the patient's skin. The active electrode is a silver-iridium wire, 25 mm. long, 0·66 mm. in diameter, and bent at an angle of 130° 7 mm. from its extremity. As in the Guist operation, absolute haemostasis is necessary, and the field of operation should be quite dry when it is desired to mark the sclera with the electrode, but, as previously mentioned, when actual cauterisation is being performed, it is of advantage to have the field kept moist with distilled water. The active electrode must be in contact with the sclera before the current is turned on; five seconds are allowed, and the current turned off before the electrode is removed. There was an immediate drying, flattening and apparent shrinkage of the sclera in the neighbourhood of the active electrode, and a greenish-brown ring appeared around it when cauterisation was effected by the old method, but with the moist technique there is little, if any, visible reaction on the surface of the sclera. Cauterisation is repeated over the required area, about 1·5 mm. interval being allowed between each application, the distribution necessarily depending upon the size and shape of the retinal hole which, with any thin areas of the retina that may have been discovered in relation thereto, must be adequately covered. The presence of the ciliary body must be remembered and cauterisation over this area avoided. The operation is completed by allowing the sub-retinal fluid to escape from the region in which the detachment was deepest, a free flow of this fluid is usually obtained, however, over the site of cauterisation showing that the former has not been coagulated by the strength of current used. This stage of the operation is usually carried out by trephining the sclera with a 1·5 mm. trephine, and perforating the choroid with a blunt instrument, or the electrode may be allowed to stay in contact with the

sclera at one spot until perforation occurs, whilst both Goulden and Doyne favour the thermo-cautery.

The results obtained with this type of operation are shown in the following table in which are included the ten cases operated upon previously by cautery puncture or the Guist operation :—

TABLE VI

	Diathermy (60 cases) Holes present.			(12 cases) "Blind" operation		
	Cure	Improved	Failure	Cure	Improved	Failure
Emmetropia - - -	(21) 11 (52·4%)	1 (4·8%)	9 (42·8%)	(1) 1	0	0
Myopia (0–5 D.) - -	(21) 12 (57·2%)	5 (23·8%)	4 (19·0%)	(1) 1	0	0
Myopia (5–10 D.)- -	(7) 4 (57·1%)	1 (14·3%)	2 (28·6%)	(4) 0	0	4
Myopia (over 10 D.) -	(10) 4 (40·0%)	2 (20·0%)	4 (40·0%)	(3) 1	0	2
Aphakia - - - - - -	(1) 0	0	1	(3) 0	1	2

Hence of all cases operated upon by diathermy 47·2 per cent. were cured and 13·9 per cent. improved. For those cases in which retinal defects were discovered the figures are 51·7 per cent. and 15·0 per cent. respectively, and for those in which no retinal holes were found prior to operation 25·0 per cent. were cured and 8·3 per cent. improved. Of five cases previously operated upon by Gonin's operation, two, both emmetropes, were subsequently cured by diathermy, and of four cases which had been operated upon unsuccessfully by the Guist method, one, again an emmetrope in whom no retinal defects had been discovered, was later cured by the Larsson operation. The case which had failed to respond to both a "blind" cautery puncture and a multiple trephining operation obtained no improvement from a subsequent diathermy.

Complications following this type of operative treatment have been notably small in number. In no case was there any marked increase of vitreous opacities attributable to the operation, nor was there any extensive vitreous haemorrhage though small sub-retinal and intra-choroidal extravasations of blood were occasionally seen. There were five, or 6·9 per cent., examples of secondary holes, two of a transient uveitis and one example of a localised choroidal infarct. Thrombosis of a vortex vein did not occur.

After Treatment

For all types of operative procedure, the after treatment has been conducted upon more or less similar lines. On completion of the operation both eyes are bandaged and the patient nursed in such a position that the retinal hole is situated in the most dependent part of the eye; the necessity for absolute rest is emphasised. From the first a drop of 1 per cent. atropine solution is instilled daily, and

a preliminary examination of the fundus made on the fourth day. On the eighth day the conjunctival sutures are removed and the fundus again examined. Should the detachment be as extensive as before operation with no sign of improvement, bandages are not re-applied and the patient is allowed up. On the other hand, if the detachment is less extensive or should the retina be in place, both eyes are again bandaged and absolute rest secured for a further seven days. At the end of this period, whatever the condition of the retina, the eyes are uncovered and a start made with getting the patient up. A few days later the operated eye is thoroughly examined in a dark room, and special note made of the site and size of the operation scars, their relation to the retinal rent, the extent of retinal detachment (if any), and the condition of the vitreous. If the retinal hole has been secluded and the retina is in place, the field of the eye is charted, and the patient discharged from hospital. In successful cases, particularly after diathermy, a considerable swelling of either coagulated choroid or a residuum of sub-retinal fluid, over which, of course, the retina is raised, is not uncommonly seen, and this appearance of a residual retinal detachment may remain for some weeks. All cases are kept on atropine for at least a month after discharge. More especially is this important in those cases in which the detachment has not been cured and a second operation contemplated, for a quiet plastic iritis is liable to develop at any time when the retina has become detached.

The Operative Procedures Compared

In the following table are shown the results obtained in all cases operated upon by cautery puncture, multiple trephining and diathermy together with the chief complications observed, all figures being expressed as percentages:—

TABLE VII

	Results		Chief complications			
	Cure	Improved	Secondary holes	Vitreous haemorrhage	Uveitis	Thrombosis vortex vein
CAUTERY PUNCTURE						
Holes present -	29·9	10·3	17·6	7·2	4·5	0·45
"Blind" operation	0	11·8				
MULTIPLE TREPHINING						
Holes present - -	26·3	14·2	11·4	7·6	2·5	2·5
"Blind" operation	22·7	18·2				
DIATHERMY						
Holes present - -	51·7	15·0	6·9	0	2·8	0
"Blind" operation	25·0	8·3				

For cases with retinal dialysis the objective in each type of operation has been the same—to produce a barrage of scar tissue

immediately posterior to the tear, and in cases having localised holes behind the ora the zone of operative choroiditis has been so placed that when the sub-retinal fluid has escaped and the retina returned to its normal situation the hole may be in the centre of this zone and so become secluded. In cases having no visible holes the "blind" cautery puncture was performed in the old way over the most prominent portion of the detachment; with the Guist operation and with diathermy the procedure adopted was to cauterise at the periphery a quadrant of the retina corresponding to the initial field loss, on the assumption, of course, that a peripheral defect was present but not visible to ophthalmoscopy. Should the patient be unable to give material assistance, a zone immediately behind the ora throughout the extent of the detachment was cauterised, a complete circuit being made if the detachment was total. It is obvious that Gonin's operation has a limited application in such cases, in fact no success was obtained at Moorfields with a "blind" cautery puncture whereas with multiple trephining there were 22·7 per cent. of cures in "no hole" cases and with diathermy 25 per cent. Cautery puncture, moreover, is a drastic operation, necessarily traumatising the vitreous in cases where it is already only too frequently degenerate and producing a dense mass of scar tissue welding together all coats of the eye with the result that the incidence of secondary retinal rents is greater in this than in the other types of operation. Further, the cautery must "hit off" the retinal tear with absolute precision, which requires a very exact localisation of the hole, a procedure beset with difficulties, particularly when the hole is situated on a ballooned detachment and at some distance from the periphery; with large or multiple rents more than one cautery puncture becomes necessary, whereas with the other two methods no such accurate localisation of the rent and multiplicity of operations is required since an extensive, or more than one, area can be cauterised at a single operation. In both the Guist and Larsson methods the field of operation is essentially outside the vitreous chamber, a decided advantage when compared with that of Gonin in which a local coagulation, and at times a true loss of vitreous takes place.

The chief objections to the Guist-Lindner operation are that it is tedious to perform, and the technical difficulties of multiple trephining of the sclera, often at a considerable distance from the limbus, are great, for the risk of perforating the choroid is always present, after which completion of the operation becomes difficult and at times impossible. The Larsson operation would appear to possess all the advantages of that of multiple trephining without the attendant disadvantages, and in my opinion is the most satisfactory method yet devised for the treatment of simple detachment of the retina.

Visual Results

The field is apparently restored rapidly on the retina becoming replaced, for the great majority of cases in which the retina was *in situ* 10-14 days after operation have given a full field to a one or a half degree white object at a third of a metre, at the most there being only a small loss corresponding to the site of operation. A full field was obtained in a case successfully treated and having a history of two years' duration, but in one in which the detachment had been present for six and a half years and was cured by operation, no improvement in visual field resulted. The improvement in central vision has been variable. If the macula has not been involved in the detachment, visual acuity is unaltered by the operation unless, on account of vitreous opacity, a line or so less on Snellen's type may be read for a while, but, on the vitreous clearing, a process which varies with the amount of opacity and takes usually some two to three months, central vision returns to normal. If the macula has been involved in the detachment and the case has been successfully treated, central vision on the patient's discharge from hospital is usually 6/36 to 6/24 partly. In these cases there seems to be no question that a gradual improvement in central vision occasionally occurs over and above that merely dependent upon a clearing of the transparent media, for isolated examples have occurred in this series of a restoration of visual acuity to 6/9 and even 6/6 Snellen when there has been no doubt concerning the previous implication of the macula in the detachment.

With regard to the 79 cases in which no operative measures were employed, in 57 of these no retinal defects were discovered after prolonged and repeated searching; it is of interest to note that no less than 12, or 21 per cent., were aphakic subjects, and that 46 of these "no hole" unoperated cases occurred before the introduction of multiple trephining and diathermy, aptly demonstrating how greatly the latter procedures have enlarged the operative scope in detachment of the retina. Of the 22 cases in which retinal holes were found and no operation performed, in seven the rent was considered too large to merit operative interference; in five the rents were multiple, widely separated, and the retina atrophic; in three the hole was too far back and thought inaccessible for operation; in two the detachment was considered of too long standing; in two there was a concomitant uveitis; two of the subjects refused operative treatment, and in one the age of the patient militated against operation.

The objective of each of the operative methods mentioned in this paper has been to close the retinal defect, and I feel that ophthalmology, and indeed mankind in general, owes a debt of gratitude to Jules Gonin for having pointed out the importance of a retinal tear in the aetiology of simple detachment of the retina, and for having devised the pioneer operative means for secluding the retinal hole.

In conclusion I wish to express my thanks to all members of the Honorary Staff of Moorfields Eye Hospital, who have so kindly allowed me to utilise the case records of their patients, and to the almoners for assistance in the "follow-up" of this large series of cases.

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VASCULARISATION OF THE WHOLE VITREOUS IN A CASE OF HAEMORRHAGIC RETINITIS, WITH RETENTION OF NORMAL ACUITY OF VISION

BY

D. V. GIRI

EASTBOURNE

MRS. E. P., aged 62 years, a patient of the Royal Eye Hospital, Eastbourne, was first seen by me in 1919, when the eyes were healthy. Seen by Mr. G. B. Lowe, in June, 1925, he noted "very hazy media, each eye, but nil seen to account for same." Again in June, 1929, she came complaining of temporal headaches, seeing black spots, and a sort of cloud in front of L.E. especially when reading; then the R.E. was healthy; in the L.E. there was no appreciable change in the media, but there were numerous flame-shaped retinal haemorrhages in the central region; nothing abnormal was noted about the retinal vessels. She was referred to her Doctor, and his report ran "...I have attended her for sundry ailments from time to time, chiefly 'colds,' etc. Heart sometimes irregular, accentuated 2nd sound, B.P. 150. Urine—trace of albumen—no deposit — not examined microscopically. Patient has a cystic goitre."

The patient was put under treatment, and kept under periodical observation. March 20, 1930.—R.E. Media and fundus normal. L.E. Haemorrhages considerably absorbed. A number of pale yellow angioid streaks seen.

June 30, 1930.—R.E. Media and fundus normal. L.E. The whole disc is veiled by a thin membrane; the angioid streaks persist; haemorrhages further absorbed.

September 22, 1930.—A gossamer-like vascularised membrane masking disc and extending across vitreous in all directions. Best seen with the Gullstrand ophthalmoscope binocularly.

February 9, 1931.—What was noted as angioid streaks appears to be an obliterated artery. The sheaf of arborescent vessels in membrane exceedingly well marked. The retinal arteries are very fine and some have become spiral.

November 19, 1931.—At the disc, the superior temporal retinal vein is extremely attenuated or obliterated. The sheaf of vessels is growing further forward into the vitreous. Fresh retinal haemorrhages.

May 30, 1932.—Gullstrand binocular ophthalmoscopy: L.E. the arborescent vascularisation involves the whole vitreous, and the vessels seem to reach up to the anterior end of the vitreous.

November 31, 1932.—The vascularisation of the vitreous persists; the branching appears dichotomous, but there are no free terminals, all ending in loops and constituting an unbroken network. No haemorrhage seen.

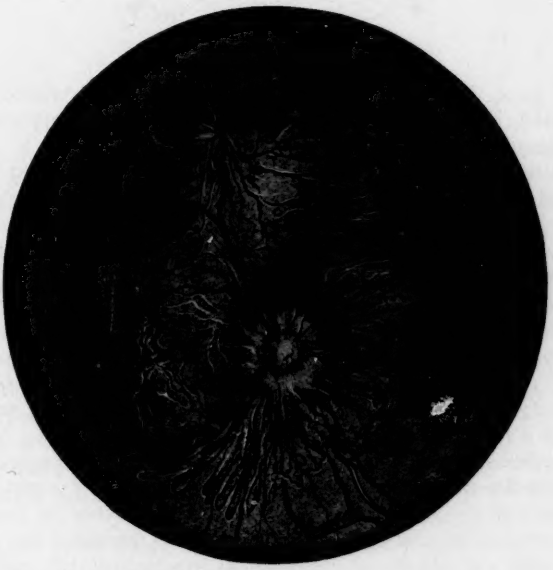
R.V. $\bar{c}$ + 1·0 D. sph. ⊂ + 1·75 D. cyl. axis horiz. 6/6 partly.
L.V. $\bar{c}$ + 1·0 D. sph. ⊂ + 1·5 D. cyl. axis horiz. 6/12 partly.

On February 14, 1933.—

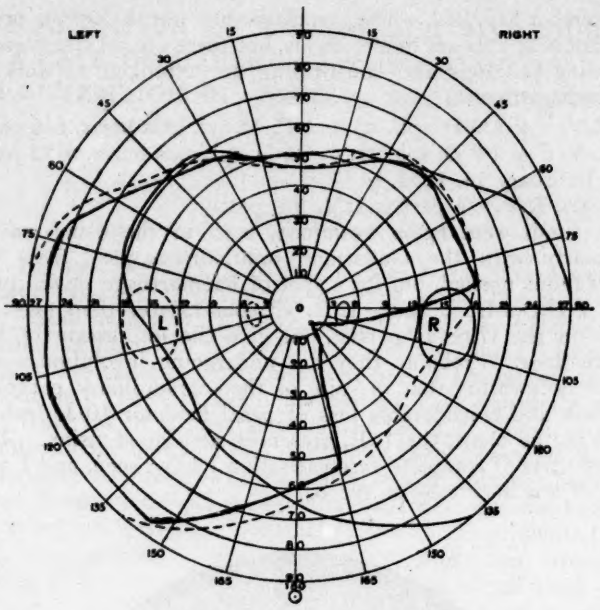
$\bar{c}$ gls. R.V. 6/6 partly, L.V. 6/6 partly.

The fundi were again examined, both in the usual way, and binocularly with the Gullstrand ophthalmoscope. R.E. Media clear, fundus normal, but for a spot of haemorrhage down and out about 2 D.D.s from disc. L.E. vitreous clearer than ever. The vessels in the vitreous persist, but give the impression of having become finer. Probably they are undergoing involution.

It is noteworthy that in spite of the extraordinary pathological condition and considerable loss of nasal field for 10/330 white, as shown in the chart, the L.E. preserves such good vision. This is the first case of complete vascularisation I have seen, and I am not aware of any such case on record.



N.B.—In actual ophthalmoscopic examination no part of the fundus can be seen clear of the vessels that fill the vitreous, as is shown in the drawing. What looks flat in the drawing has to be visualised as an arborescence extending axially forwards towards the back of the lens.



From June, 1929, to July, 1930, the treatment consisted in subcutaneous injections of 1 c.c. of "Collosol" Iodine, every other day, and taking internally:—

Plasmona, a dessertspoonful t.i.d. at meals, "Tabloid" Mixed Glands (female) B. W. & Co., 1 tablet, and parathyroid gland 1/40 grain c. calcium lactate 5 grains (P. D. & Co.) one hour before food, with intermissions of two to four weeks about every three months.

From July, 1930, until August, 1931, the subcutaneous injections of iodine and the parathyroid and calcium lactate tablets were dropped, and Riodine (a pill containing an organic compound of iodine) 1 t.i.d. and Calcium Diuretin (Knoll) 1 t.i.d. half-an-hour after food, by the mouth, were prescribed instead, with occasional breaks of a fortnight to a month.

This almost complete absence of fibrosis and prevention of retinitis proliferans, the striking clarity of the vitreous and remarkable acuity of vision are in great measure ascribable to the line of treatment adopted and the long period it was persisted in.

This case was shown at the clinical meeting of the ophthalmic section of the Royal Society of Medicine, held on January 13, 1933.

P.S.—Patient gets attacks of bad frontal pain followed by unconsciousness, for how long she does not know. The attacks come on

about once in six months, and last about an hour. At the end of attack, patient feels exhausted and goes to sleep. Said to be still during the attacks. Has had five attacks in two years. Has been exceedingly well since the beginning of last summer.

N.B.—Since writing this report I have seen the patient several times. L.V. was 6/9 on August 8, 1933. She started internal medication and as she began to get better she took ill, and had to stop it. On October 9, 1933, L.V. was 6/12. On October 25, she noted that the L.E. went suddenly worse. On November 2, a detachment of the retina at the lower periphery was evident in the L.E. On November 9, it was seen to be more extensive.

Owing to the pathological condition of the L.E., and the useful R. eye, as well as her very unsatisfactory general condition, it has not been considered advisable to operate for the detachment.

NEW VESSEL FORMATION IN THE VITREOUS

BY

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LEBER[1] has described new vessel formation in the vitreous, the vessels arising from the retina as well as from the disc. The formation of new vessels, usually small capillaries, frequently follows inflammatory processes of the retina and particularly of the disc, but these are so minute that they can hardly be observed as such, and merely give the appearance of a somewhat hyperaemic disc. When their calibre is larger they appear on the disc as fine radial vessels.

New vessels which are visible ophthalmoscopically arise most frequently from deep and chronic inflammatory processes, resulting in localized disturbance or interruption of the circulation. Into the exudates which are formed, the new vessels grow.

They have also been observed in cardiovascular disturbances, particularly when associated with vascular disease of the retinal vessels.

In such cases there is often developed a system of collateral vessels, which take over the nutrition of the retina. This type of new vessel formation is not infrequently seen in arterio-sclerosis which has ended in an obliteration of the arteries.

Less often it is seen after thrombosis of the central vein or its

branches, or during the course of a retinitis haemorrhagica. Cases are also recorded of glaucomatous eyes in which very tortuous new vessels have developed on the disc—these being distinguishable from the tortuous retinal vessels so often seen. All these vessels run more or less in or on the retina. Not infrequently they leave the retina and extend into the vitreous, especially in cases of haemorrhage and trauma, in retinitis proliferans, in inflammatory tumours of tuberculous or luetic nature, and also in encapsulated abscesses of the vitreous. As a partial detachment so often results, whereby the retinal vessels are displaced forwards, it is often difficult, especially when the media are turbid, to distinguish between new-formed vitreous vessels and pre-existing retinal vessels. The former however usually form a much closer network of vessels of about the same calibre, and are much finer than the retinal vessels.

A much rarer form of new vessel formation is the type in which new vessels grow out from the disc into the vitreous. This form has been described in the literature and cases have been recorded in which the vessels are said to have grown from the disc into an apparently clear vitreous. But more usually some vitreous opacity or haemorrhage into the vitreous has been the cause of the new vessel formation. Marple[2] described this form of new vessel formation as a particular form of retinitis proliferans.

These vessels may extend forward deep into the vitreous as single vessels or more complicated anastomosing masses, but in some cases a fine, delicate, close network of vessels is formed which floats like a veil in front of the retina.

If there is no recurrence of the vitreous haemorrhage or if the retinitis subsides, these vessels may, over a long period of years, gradually recede and even disappear.

During 1932 and 1933 the following four cases presented themselves at the out-patient department of the First Eye Clinic of Professor Meller in Vienna, and they are recorded as illustrating some points in the aetiology and course of new vessel formation in the vitreous.

Case I

Leopold H., aged 22 years, entered the Clinic in April, 1927, with a complaint of having been struck in the left eye 14 days previously, from which time his vision had begun to fail. Family history and past history essentially negative.

General examination showed a left anterior adhesive apical pleurisy and a mitral stenosis and insufficiency. Blood Wassermann strongly positive on repeated examination. Intradermal tests with old tuberculin and tebeprotein were strongly positive in dilutions of 1/100 mg. and 1/10 mg.

Examination of eyes:—Left eye—vision 6/9, not improved, J.1. There was marked ciliary injection, with some bedewing of the corneal epithelium, and many precipitates on the posterior surface of the cornea. The anterior chamber was deep and aqueous cloudy. Iris very hyperaemic, pupil round and dilated (atropine). There was slight opacity of the vitreous, through which the fundus was somewhat dimly seen, but the disc was sharp in outline, the vessels normal, and there was no macular change.

Right eye—vision 6/5 J.1, entirely normal. Anti-luetic treatment (neosalvarsan) was immediately instituted, and shortly afterwards treatment with tebeprotein.

The condition of the left eye became worse, and a few days later deep vessels were seen growing into the cornea, an interstitial keratitis gradually forming, which, however, never affected the whole cornea, the vascularization occurring only in certain localized areas, and not spreading. A severe iritis remained the predominant feature, with increasing precipitates on the posterior corneal surface, and a hypopyon. The vitreous became progressively more opaque.

In June, 1927, the right eye became painful and on examination showed marked ciliary injection, slight clouding of the corneal epithelium, many fine precipitates, and a very turbid aqueous. In July of the same year, the condition of this eye had progressed to a point very similar to that of the left eye. The vision at this time was—right eye, 6/18 J.1; left eye, 6/60 J.9. The patient was discharged from the hospital at this time for personal reasons, having received 3 grams neosalvarsan. and tebeprotein up to 3·3/1000 mg.

In November, 1927, the patient was re-admitted and examination showed: blood Wassermann reaction negative, spinal fluid Wassermann positive. Intradermal tests with tebeprotein were repeated, and the patient reacted so sharply to 1/100 mg., that his temperature rose to 102°F. Right eye—vision 6/18 J.2. Slit-lamp examination showed slight scars in the deep corneal stroma, and almost obliterated vessels. A few large precipitates were seen, and in the lower part of the anterior chamber were masses of organized exudates. There were a number of small sharply outlined nodules in the iris stroma, and many delicate posterior synechiae were still present. The lens was normal, but the vitreous was very cloudy.

The disc was seen only indistinctly. It was hyperaemic, slightly prominent, with large veins and normal arteries. Haemorrhages were present around the disc, most of them along the course of the enlarged veins, and one of these seemed to project forward into the vitreous. This haemorrhage showed a definite tissue of new-formed vessels about it, which, a few days later, began to spread downwards, taking a wing-shaped form, fastened at the disc and projecting into the vitreous. It consisted of a delicate membranous framework in which the blood vessels ran radially, forming a thick anastomosis at the edge.

In addition, at the temporal free edge of the disc was seen another structure, spur-shaped, rising in front of the disc and swaying in the vitreous in which the arrangement of the new-formed vessels could be seen particularly well. Left eye—vision 6/24 J.3, presents a similar picture except for the absence of haemorrhages. Both eyes showed a large central scotoma for colours, but normal peripheral fields.

In August, 1932, the patient returned for a third time having had no symptoms for several years. Vision—Right eye, 6/9 J.1; Left eye, 6/12 J.1. Examination showed no ciliary injection. There was some organized exudate on the posterior corneal surface in the lower quarter, but no precipitates, and the aqueous was clear. The lenses were normal. In the right eye the vitreous was normal with no opacities, and the disc was of normal colour with sharply defined edges. From the disc the remains of the new vessel formation extended vertically in the form of a gray strand which branched as it came forward. In the left eye, the vitreous was normally transparent, the disc sharp in outline and normal in colour.

Comments

It will seem, at first glance, that the aetiological factor in this case is fairly clear, but upon closer study such is not the case and although, in all probability, it will be generally agreed upon that this patient's eye disease was luetic in nature, we wish to call attention to the following facts.

1. That the condition in both eyes started as a very acute and severe iridocyclitis and that throughout the course of the disease this iridocyclitis remained the predominant feature of the picture.

2. That the keratitis described above, although an "interstitial" one, in that it was the deep layers of the corneal stroma which were involved, was not in any sense the classical luetic interstitial keratitis, but rather seemed to be the result of and secondary to the violent iridocyclitis.

3. That the condition of the eyes became progressively worse in spite of anti-luetic treatment.

4. That the patient reacted unusually strongly to tuberculin.

On the other hand, though the fundus findings were consistent with a tuberculosis of the eye, this finding of new-formed vessels is more common as a syphilitic lesion. In short, the findings in the anterior segment of the eye speak strongly for tuberculosis while those in the posterior position are of the type more often seen in lues.

The question of arterio-sclerosis and diabetes, both of which have been mentioned as a possible aetiology in this condition, played no part in this case.

Case II

Theodora N., aged 56 years, entered the Eye Clinic in October, 1927, with a complaint that she had first noticed a violet cloud over the right eye in 1925, continuing up to the present time. Early in 1927 this cloud became suddenly thicker and vision was almost completely lost in the right eye. Family history and past history essentially normal.

General examination showed no definite evidence of any heart, lung, or circulatory disease and the Wassermann reaction was repeatedly negative on blood and spinal fluid.

Examination of eyes:—Left eye—vision 6/6, J.1, entirely normal; right eye—vision hand movements. Field shows a lower nasal quadrant defect. The anterior segment of the eye is essentially negative.

At the first examination large vitreous haemorrhages blocked the view so that details of the fundus were seen with difficulty—but there were no gross changes at the disc and certainly no new vessel formation.

In February, 1928, vision was improved to counting fingers at 2½ metres and the vitreous opacity had cleared sufficiently to give a clear view of the fundus, and during the next few days, with further

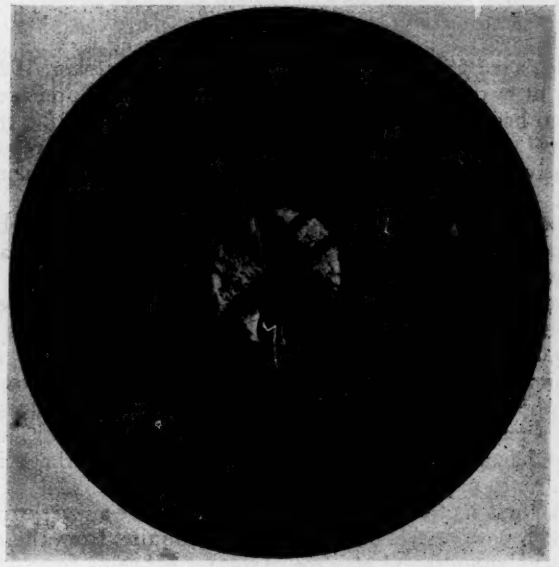

FIG. 1.

clearing, it was possible to distinguish a full development of new-formed vessels at the disc, the convoluted net extending far forward into the vitreous. (See Fig. 1.)

As time went on the vitreous cleared completely and with its clearing the new vessel formation became less and less distinct and more and more delicate until it had practically disappeared.

Comments

Here the aetiological factor was even less clear than in the first case. The anterior segment of the eye was at no time involved and there was no evidence of either tuberculosis or syphilis, by general or serological examination. Diabetes and arterio-sclerosis of any marked degree were excluded as before.

The marked similarity, however, between the two cases is found in the manner of appearance and especially of regression of the new vessel formation. In each case these new vessels were made visible by the relatively rapid absorption of massive vitreous haemorrhages followed by the gradual regression of the vessels themselves when their reparatory work was done; for we are forced to look upon them as reparatory agents whose function was solely the removal of the extraneous "foreign matter" in the vitreous.

Case III

Otto F., aged 55 years, entered the Clinic in October, 1929, with a history of having been previously admitted in 1928, on account of pre-retinal haemorrhage in the left eye. At that time the right eye was normal with a vision of 6/6 and J.1. The haemorrhage ended in an extensive retinitis proliferans, and a complete detachment of the retina.

Three days before the present entry he had noticed bright lights before the right eye and a diminution of vision. Family and past history were essentially negative.

General examination showed the presence of an active tuberculous lung process, and the cutaneous reaction to tebeprotein was positive to 1/100,000 mg. Wassermann reaction was negative.

Examination of eyes:—Left eye—blind, with complete detachment of the retina. Right eye—Vision, fingers at 5 metres. The anterior segment of the eye was essentially normal. There was extensive haemorrhage from the retina with haemorrhage into the vitreous.

For the first six to eight months there was little apparent progress, after which new vessels began to be seen running from the disc and from the neighbourhood of some of the retinal veins from which the bleeding had occurred.

The massive vitreous haemorrhage became surrounded by delicate endothelial channels, and in a short time the resorbing action of these new-formed vessels was quite evident, so that marked clearing of the vitreous took place, and the vision improved to 6/12 and J.3, while the vessels themselves began gradually to regress.

During all this time the patient had been confined to bed and given treatment with tebeprotein so that he gained in weight, and his general condition improved.

Comments

In this case the aetiology is obvious as a tuberculous retinal periphlebitis with resulting vitreous haemorrhages. What part the tuberculin treatment played in its cure is more difficult of assessment, but that the new vessel formation was of a definitely reparative nature, there can be even less doubt than in the two preceding cases.

Case IV

Ludwig R., aged 52 years, came to the Eye Clinic with a history of having had diminution of vision in the left eye for several days. Family history essentially negative. Past history:—In 1905 patient had a luetic infection. He received two mercury injections and two courses of neosalvarsan and two years ago treatment with malaria. Later he had intramuscular injections—nature unknown.

General examination showed a luetic mesaortitis and considerable cardiac dilatation with moderate emphysema of the lungs. The serum and spinal fluid Wassermann was negative. Luetin test was positive. Intra-cutaneous tuberculin test positive to 1/10,000 mg.

Examination of eyes:—Both eyes showed a normal anterior segment except that the pupillary reactions were sluggish to light. Right eye—otherwise normal throughout observation—vision 6/6 and J.1; left eye—vision 6/18 and J.1.

The disc was somewhat pale and at its lower temporal pole there was a small pre-retinal haemorrhage extending into the vitreous. Below and on the temporal side there was a large crescent-shaped haemorrhage about 3 to 4 disc diameters in length and forked so as to enclose the macula. Above this were several small haemorrhages extending as far as the macula.

Observation over a number of months showed no great change in spite of continued anti-luetic and tebeprotein treatment, except that the larger forked haemorrhage was mostly absorbed, but its place was taken by a long, narrow, extensive crescent-shaped haemorrhage below the macula, while at the extremities of the larger vessels above the macula there were numerous

small punctate haemorrhages hanging in some cases like grapes from the smaller capillaries. (See Fig. 2).

The vision gradually improved to 6/9 and J.1.

The patient was discharged and ordered to report for further examination.

In the course of a long observation we were able to establish that the pre-retinal haemorrhages had not spontaneously resorbed. On

FIG. 2.

the contrary they broke through in several places into the vitreous and lay in the form of thick vitreous clouds in front of the original haemorrhagic areas.

About a year later new-formed vessels sprouted out from the damaged retina into the vitreous chamber and surrounded the blood masses located there, thereby presenting in due time the typical picture of new vessel formation in the vitreous.

An indication of this new vessel formation is to be seen in the previously mentioned figure (Fig. 2).

FIG. 3.

One of us saw this case at a still later date (January, 1933) when the new-formed capillary network had brought a great part of the vitreous opacities to resorption and afterwards with the continued clearing of the vitreous, the vessels themselves regressed. (See Fig. 3.)

Comments

The findings in this case are closely reminiscent of those reported in the literature under the heading of new vessel formation in the retina. In as much as the first development of these new vessels was presumably, on the retina, we must think of them as formed for the purpose of absorbing the massive retinal haemorrhages.

When, however, these large haemorrhages broke through into the vitreous as described above, the new vessels "followed" them and, as in the preceding cases, when their work of absorption was done they regressed.

As to the aetiological factor here, we are forced to consider it as luetic, as, indeed, are most of the cases reported in the literature.

As has been mentioned the most common aetiological factors in this condition are lues, tuberculosis, diabetes and arterio-sclerosis. Of these, Case I is probably luetic, Case II is unknown, Case III is

tuberculous, and Case IV luetic. In each case regardless of the aetiology, the primary factor was vascular disease, and in each, the course and ultimate outcome were the same.

We are indebted to Prof. Dr. Meller for his permission to publish these cases and to Dozent Dr. Urbanek for his helpful co-operation.

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2. **Marple.**—Contribution to the Pathology of Vascular Growth into the Vitreous. *Trans. Amer. Ophthal. Soc.*, Vol. IX, p. 254.

LEAD POISONING IN THE FIRST CENTURY

BY

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ONE of Martial's Epigrams[1] suggests the possibility that we have an allusion to a contemporary case of lead poisoning with optic neuritis.[2] The poet, a debauched and scurrilous Spaniard from Aragon, lived in the days of Nero and Domitian and died somewhere near the year 104 A.D. when over 60 years of age, so the case in question can be roughly dated as occurring in the first century of our era. The epigram is to the effect that a chronic soaker of the name of Phryx had lost the sight of one eye, and was going blind in the other as well. His doctor Heras warned him that the effect of continuing his drinking would be total blindness; at which the patient laughed defiantly and, saying "Good bye" to his remaining eye, ordered cup after cup of his forbidden tipple. "Do you ask the result? While Phryx drank wine his eye drank poison."

The two ingredients of spirituous and other liquors capable of giving rise to optic neuritis are methyl alcohol (or its concomitant impurities) and lead. Methyl alcohol is a dope whose presence in potable liquors is the result of ignorant sophistication with an industrial spirit; lead was a common ingredient of wines and cyders into comparatively recent times, and in lead poisoning there is a substantial danger of optic neuritis and atrophy. Wines and cyder which contain acids quickly become contaminated in contact with lead. It was the frequency of colic in certain of the cyder districts of Devonshire which gave the name of Devonshire colic, as the frequency of it in Poitou gave the name *côlica Pictonum*.[3] In another of his Epigrams[4] Martial quite definitely alludes to the presence of lead as a contamination in wine, the special variety indicated by him being new (and so probably crude and highly acid) Sabine wine. Alcohol itself may lead to visual hallucinations, such

as occur in delirium tremens, but that is quite a different affair from loss of vision.

In these Epigrams Martial alluded by name to quite a number of the contemporary physicians in Rome, some of them evidently being Greeks[5] (probably vastly superior in professional knowledge and skill to the native product), and two at least being professional failures[6, 7], at whom Martial, as was his way, took the opportunity to fling brutal taunts. Alcon[8, 9] Baccara, a Greek,[5] Carus,[10] Cascellius, a dentist,[11] Dasius,[8] Diaulus, a one-time ***chirurgus***,[6] Eros, a beauty-specialist,[11] though cosmetic operations seem also to have been undertaken by the barbers,[12] Fannius, a throat-specialist,[11] Heras,[13] Hermes, a herniotomist,[11] Hermocrates,[14] Herodes,[15] Hippocrates,[16] Hyginus, an eye specialist,[17] ——another oculist (***ophthalmicus***) is pilloried, but not named,[18]—Paccius,[19] Symmachus,[20] Sota,[22] are professional names appearing in his verses; and there may be more, as I do not pretend to have made anything like an exhaustive search for them. In one place[21] he alluded to the ***medicae***, or women practitioners, but without giving their names. It is unnecessary to remark that there were very many more doctors in Rome than ever happened to obtain the not very enviable distinction of being alluded to by Martial, who was a man of the type that would have found itself sadly at a loss in any country in which there happened to be a law of literary libel. Galen, for instance, gives Andromachus as the name of Nero's physician; Thessalus of Tralles, flourished and blustered in Rome in the time of Nero—and there can be no doubt that a certain Syrian physician of the name of Luke had been in Rome in these days. Heras, however, is memorable as the physician who, according to this casual reference, correlated visual disability with wine-drinking (or as we might put it, optic neuritis with lead poisoning); and had the courage of his convictions sufficiently to advise removal of the cause of the mischief so as to prevent further progress of the threatened blindness. It was not his fault that the patient, with debauched cynicism, refused to follow the advice he had been given. Another interesting allusion to optic neuritis in the first century is given by Celsus who associated blindness and headache with the presence of meningeal haemorrhage from direct cranial injury (***de medicina, VIII. 4) : isque ibi concretus magnos dolores moveat, et oculos quibusdam obcaecet.*** The treatment he advocated was trephining (*l.c.*). He also noted the occurrence of epilepsy with ocular palsy and visual defect (VI. 6. 36), a group of symptoms into which can be read the papilloedema or optic neuritis of raised intracranial tension, such as may be found in the presence of a cerebral tumour. Cervical rigidity is mentioned in the same work as a sign of meningitis (VIII. 4).

It may serve to place the foregoing details in their correct perspective if the following historical summary with regard to such

lead-poisoning from the ingestion of contaminated beverages be read in connexion with it. Sir George Newman, in his recent book of essays under the title of *Interpreters of Nature*,[23] reminds us that John Huxham, who was born in 1692 and practised in Plymouth, was, in 1739, the first to describe the Devonshire colic, "though he did not know the cause of it. A similar malady was observed by Cadwaladr in 1745 in the West Indies in drinkers of rum distilled through leaden pipes, and in 1757 by Tronchin, the talented physician of Geneva, in drinkers of lead-sweetened wine. Ten years later this mystery was cleared up by Dr. (afterwards Sir) George Baker . . . His 'Essay concerning the Cause of the Endemical Colic of Devonshire,' showed that the disease was connected with large pieces of lead used in the vats and cyder-presses, and he extracted lead from the cyder itself. His work, though it concerned a small and circumscribed problem, was so logical, accurate, and inductive, that it afforded a new method of investigation into the contamination of food supplies, which has been pursued by innumerable workers ever since. It opened a new chapter in the book of Preventive Medicine."

Vitruvius is said to have described chronic lead poisoning resulting from the action of drinking-water in lead pipes. He was a military engineer in the first century B.C., and dedicated his treatise *de Architectura* to the Emperor Augustus. The author of the Hippocratic Aphorisms, who may, indeed, have been Hippocrates himself in the 5th century B.C., alluded to a form of colic attended by dry dropsy (a pradoxical condition, which may be intended to cover constipation with tympanites), which may quite possibly be an allusion to plumbism. If so, the allusion is by no means as clearly recognizable as is the foregoing. In Aphorisms IV. 11, we read that "those who suffer from colic with peri-umbilical pains and aching in the loins, unrelieved either by purging or by other means, end up with a dry dropsy."

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1. *Epigg* , VI, 78.
2. This diagnosis was not recognized by H. Oppenheimer in his *Medical and Allied Topics in Latin Poetry* (1928), where he alluded to this Epigram by Martial. (*Ibid.*, pp. 141-2, 294-5.)
3. **Osler**. *Principles and Practice of Medicine*, ed. 6, 1906, p. 375.
4. *plumbea vina*, X, 49.
   Is it possible, though, that he merely meant to belittle it as a dull and heavy liquor, and spoke metaphorically?
5. *Epigg.*, XI, 74. 6. *Ibid.*, I, 30, 47. 7. *Ibid.*, VIII, 74. 8. *Ibid.*, VI, 70. 9. *Ibid.*, XI, 84. 10. *Ibid.*, X, 77. 11. *Ibid.*, X, 56. 12. *Ibid.*, VI. 64, for Cinnamus; described as a barber in VII, 64. 13. *Ibid.*, VI, 78. 14. *Ibid.*, VI, 53. 15. *Ibid.*, IX, 96. 16. *Ibid.*, IX, 94. 17. *Ibid.*, X, 56. 18. *Ibid.*, VIII, 74. 19. *Ibid.*, XIV, 78. 20. *Ibid.*, V, 9, and VI, 70. 21. *Ibid.*, XI, 71. 22. *Ibid.*, IV, 9.
23. **Newman**. *Interpreters of Nature*, 1927, pp. 131-2.

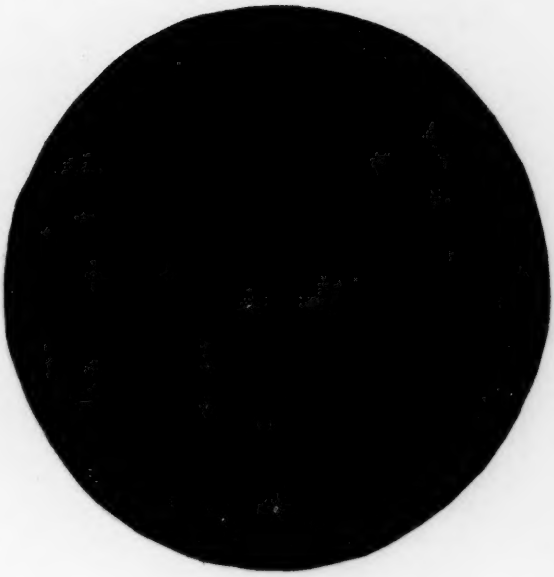

FIG. 1.--OBLIQUE ILLUMINATION.

Front view of opacity with bifurcation of hyaloid artery into vessels carrying blood. These vessels pass along the back of the lens to the posterior surface of the iris. Fine grey strands (obliterated vessels) are to be seen with diffuse beam of slit-lamp. *See* FIG. 2.

FIG 3.—OPHTHALMOSCOPIC APPEARANCE.

The hyaloid artery leaving the disc to opacity at back of lens. The column is of even bore, and as it approaches the lens two curls are seen at, and in the opacity.

PERSISTENCE OF THE CIRCULATION IN THE POSTERIOR VASCULAR SHEATH OF THE LENS IN THE RIGHT EYE OF A GIRL AGED FOURTEEN YEARS

BY

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I SHOWED this case at the recent Meeting of the Irish Ophthalmological Society.

This patient attended the Out-Patient Department of the Royal Victoria Eye and Ear Hospital, Dublin, five years ago, and the condition has undergone no change.

My rough notes, at that time, contain a reference to a grey opacity at the back of the lens of the right eye, with very fine thread-like vessels radiating over the anterior part.

A fine thin vessel (the hyaloid artery) is evidently carrying blood. The column is seen extending from the upper temporal artery to the opacity at the back of lens.

R.V. = 1/60. L.V. $\bar{c}$ + 6.0 D. sph. = 6/12.

A careful examination of all the details has been undertaken in the last few weeks, and the following conclusions have been arrived at.

The Iris.—This shows a fine strand of pupillary membrane extending obliquely on to the anterior capsule of the lens. Otherwise, there is no abnormality in this structure.

The Lens.—This shows a few small punctate opacities in the anterior cortex. Immediately behind the lens is the opacity in which the vessels are radiating. It is thicker centrally, thinning gradually to the periphery, and occupies about the middle third of the posterior part of lens. The opacity itself is thin, irregular and has a serrated margin. Through the centre a small opening can be seen, this is the point of entrance of the hyaloid artery, which divides into a descending branch and two nasal branches, the latter unite again into a common trunk. (See Fig. 1). With the slit-lamp, the blood is seen definitely coursing away from the centre, downwards in the descending branch, nasally in the other two branches. (See Fig. 2). The lower column can be traced as far as the posterior surface of the iris (the pupil being well dilated with atropine). The common trunk formed by the nasal vessels can be traced for a short distance and disappears behind the iris. In addition to these vessels, which are evidently carrying blood, two fine grey streaks, or strands, can be seen radiating from the central trunk laterally; one nearly at "9 o'clock" and the other nearly at "7 o'clock." (See Fig. 2).

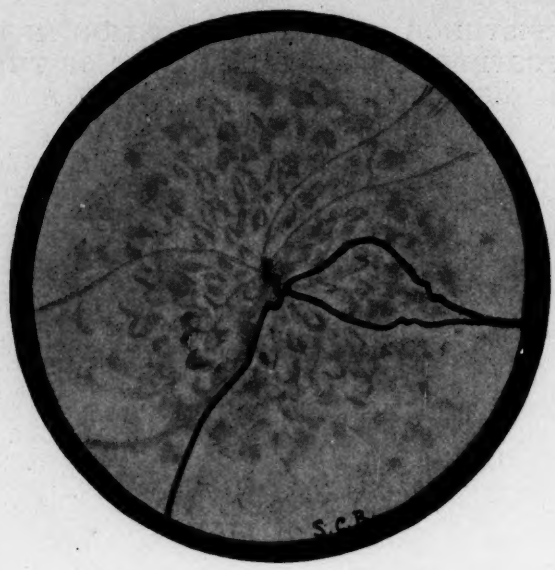


FIG. 2.—SLIT-LAMP APPEARANCE.

Some fine strands can be seen filling up the interval between "12 o'clock and 3 o'clock." These, however, are not of the same definition as the two temporal ones described; they have the appearance of obliterated blood vessels.

The Hyaloid Artery.—Tracing the main trunk (which can be seen entering the opacity) backwards, we see two bends, or curves, which are made immediately behind the opacity; there is no irregularity of width, or bore, of this column, so far as I can make out. With the ophthalmoscope it appears black, but a red glint along the upper border can be obtained. The column is traced back to the disc. Here we experience the greatest difficulty in deciding its origin. The inferior temporal artery overlies the vein for a short distance, and it seemed to us that the vessel entered the artery just where it separates from the vein. We have finally come to the conclusion that the connective tissue overlying the vessels is responsible for this impression, and that the column ascends and enters the central artery. In other words, the hyaloid artery comes from the central artery and is involved in the connective tissue for part of its course from the disc. There is a certain amount of upward and downward movement of the column in the vitreous.

I am indebted to Mr. Crawley for permission to publish this case, and to Mr. Somerville Large for his help in studying it.

ABSTRACTS

I.—CORNEA

(1) **Reid, A. Christie (Nottingham).—Metri-cautery for infected corneal ulcers.** *Lancet*, January 14, 1933.

(1) **Reid's** modification of the design of Prof. Wessely takes the form of an electric cautery with thermometer attached. The instrument is provided with a resistance and it plugs into the mains. The point should be heated until the thermometer shows 75° C. and it should not be applied at over 85° C. The instrument is made by Down Bros.

ERNEST THOMSON.

(2) **Glimstedt, Gösta (Lund, Sweden).—The treatment of serpigenous ulcer from the bacteriological point of view. (Die Therapie von Ulcus corneae serpens vom bakteriologischen Standpunkt).** *Acta Ophthal.*, Vol. X, p. 291, 1932.

(2) **Glimstedt** reviews exhaustively the 117 cases of serpiginous ulceration of the cornea seen at Lund during the three years 1928-30; all were treated as in-patients. The peak months were March, June and August, and 67 per cent. of all cases were seen during the six summer months, March to September. The youngest patient was 9 years old and the oldest 86, but 88 per cent. occurred between the ages of 40 to 80, the greatest frequency being in patients between 60 and 70 years of age (27 per cent.). No case was seen between 20 and 30, and only 2·5 per cent. between 30 and 40. Only 31 per cent. of the cases occurred in women. It is mostly in landworkers that the affection is seen and 63 per cent. gave a history of trauma, generally caused by branches of trees or by chippings from stone. No basis for the view that focal sepsis is a factor could be found; infection was generally of local origin, either in the conjunctiva or lacrymal passages. In only 2·3 per cent. was full vision retained; in 4·5 per cent. the eye had to be removed; in 6·9 per cent. only perception of light remained; 61 per cent. retained useful vision (between 6/60 and 6/6).

In a critical review of recent methods of treatment the author considers moist heat useful. Optochin is of definite value but serum treatment disappointing. Only in eleven cases was the anterior chamber evacuated by section or trephine, in the latter procedure with simultaneous optical iridectomy. Local immuno-therapy after Besredka is favourably noted.

ARNOLD SORSBY.

(3) **Peter, Luther C. (Philadelphia).—Dystrophy of the corneal endothelium. Its recognition and clinical significance.** *Arch. of Ophthal.*, December, 1931.

(3) The fact that **Peter** has found 22 cases of this condition during 18 months of clinical work, shows that it is more common than is generally suspected. Basil Graves, in 1924, described it in detail in this Journal and little has been added to his exhaustive studies. The earliest stage causes no interference with vision and requires the slit-lamp for its detection, when large black, round non-reflecting areas can be found by the method of specular reflection. The condition is binocular and is most marked in the centre of each cornea. In the second stage, vision becomes affected and the dystrophy can often be recognised with an ophthalmoscope and a +20 D. lens, with which an appearance is produced resembling burnished copper. In the third stage the whole of the corneal endothelium becomes destroyed. In Peter's series of cases all but four occurred in females, at an average age of 61 years, 14 showed incipient senile cataract and eight nuclear cataract. Two cases had central toxic choroiditis, two a low grade of uveitis, and two advanced generalised arteriosclerosis. The dystrophy is probably an expression of a general lowering of tissue vitality, and for this reason healing after cataract extraction is a protracted process. Vision is reduced to 6/9 or so by the endothelial changes alone and the final stage of complete vacuolization is a stationary one.

F. A. W-N.

(4) **Aust, O. (Vienna).—On keratitis nummularis of Dimmer. (Ueber die Keratitis nummularis Dimmer).** *Arch. f. Ophthal.*, Vol. CXXIX, p. 576.

(4) The object of this communication by **Aust** is to bring to notice again a form of keratitis which was first described by Dimmer in 1905, although he did not give it at that time any distinctive name, and by an analysis of a number of cases to establish it as a definite clinical entity and bring it into line with the recognized varieties of keratitis. In order to avoid confusion with these, he has chosen this title, adding to the descriptive name "nummularis," that of his former chief.

This disease is found almost exclusively among young agricultural labourers, and occurs most frequently in the month of August. Such patients regularly give a history of onset 4 to 6 weeks previously with photophobia and lacrymation (not infrequently after a foreign body in, or slight injury to the eye), but it is only the impairment of vision for the preceding few days that prompts them to seek advice.

The condition is almost invariably unilateral, the eye when first een usually showing little or no sign of inflammation.

The most characteristic feature is the appearance in the cornea of a varying number of circular opacities, ½ to 1½ mm. in diameter, with slightly raised stippled surface; there is no regularity in their arrangement. Spots in different stages of development may be seen together, and fresh ones may be formed, which accounts in part for the characteristically prolonged course. The opacities all ultimately form facets, without any real preceding ulceration; these facets may continue unchanged for years.

With regard to the differential diagnosis, he points out the differences between this condition and Fuchs's superficial punctate keratitis, rosacea keratitis and keratitis disciformis, which resemble it in certain features.

THOS. SNOWBALL.

(5) **Heintz, G. (Kiel).—Rodent ulcer of the cornea. (Ueber Ulcus rodens).** *Zeitschr. f. Augenheilk.*, Vol. LXXVII, p. 289, 1932.

(5) **Heintz** reviews the literature on the subject of Mooren's ulcer. Only 15 cases have been reported histologically, and the author adds three of his own, and also gives details of two more observed clinically. The various views on causation are discussed, and the author, disagreeing with the theories as to neurotrophic origin, holds that the lesion is caused by a non-specific bacterial infection, operating on a cornea rendered vulnerable by metabolic disorders—or possibly of local changes in the cornea, as is the case with trachoma. In three of his cases there was some general disturbance.

ARNOLD SORSBY.

(6) **Prockosch, Marie (Vienna).—The use of contact glasses in glaucomatous corneal opacity. (Ueber die Anwendung von Kontaktgläsern bei glaukomatöser Hornhauttrübung).** *Zeitschr. f. Augenheilk.*, Bd. 78, S. 135, 1932.

(6) **Prockosch** recalls the value of contact glasses in determining whether the reduction in vision in cases of corneal opacities in the presence of lens opacities is mainly due to the lesion in the cornea or in the lens. If vision is improved by contact glasses it may be taken that the corneal scarring is chiefly responsible. On this principle the author has used contact glasses in cases of acute glaucoma; where the reduction in vision was caused chiefly by the corneal oedema, contact glasses improve vision and can be taken as a favourable prognostic sign and an indication for operation; when vision is not improved by the glass the prognosis should be guarded. Contact glasses have a further use in acute glaucoma, for the fundus can be seen through the glass during an attack.

ARNOLD SORSBY.

(7) **Pergola, Alfredo (Cagliari).—The treatment of cicatricial corneal opacities by local remedies. (Contributo alla terapia delle opacità corneali cicatriziali).** *Boll. d'Ocul.*, January, 1932.

(7) **Pergola** has made use of a combination of dionine and thiosinamin (under the name of leucolysin) and had considerable success in procuring clearing of the opacities and improvement of vision. The mixture was applied every day for a considerable period, often for two months, and in all cases there was some improvement.

HAROLD GRIMSDALE.

(8) **Fonzi, A. (Rome).—The treatment of corneal wounds and ulcers by conjunctival flaps. (Le plastiche congiuntivali nelle ferite e nelle ulcere corneali).** *Boll. d'Ocul.*, September, 1932.

(8) **Fonzi** has investigated in animals the results of covering corneal wounds and ulcers with conjunctival flaps. In making the flap he adopted in all cases, the method of Löwenstein; in this, an incision is made through the conjunctiva at the limbus in the region of the wound for about 10 or 12 mm.; from the ends of this incision, others are made at right angles to the first towards the equator of the globe; the flap thus limited is dissected up, brought down over the injured area and fixed at each side by deep sutures involving the episclera.

Fonzi finds that wounds protected in this way heal rapidly and show no tendency to lose the normal curvature of the cornea. He considers it an ideal method in such cases.

On the other hand covering by a conjunctival flap has no good effect on the course of infected ulcers, but apparently encourages greater virulence of the micro-organisms.

HAROLD GRIMSDALE.

(9) **Focosi (Florence).—A case of mycosis of the cornea due to cephalosporium. (Su un caso di cheratomicosi da cephalosporium).** *Boll. d'Ocul.*, December, 1932.

(9) In this case an obstinate ulcer of the cornea with infiltrated edges was accompanied by wrinkling of the membrane of Descemet, much keratitis punctata, and many posterior synechiae; there was no hypopyon. In spite of vigorous treatment with the galvano-cautery, the ulcer showed no sign of healing. Examination of the matter, taken from the base of the ulcer and cultivated, proved the agent to be a fungus which was recognised to be a cephalosporium. The patient was then put on increasing doses of potassium iodide and recovery followed.

Mycosis of the cornea is a rare affection though a considerable number of fungi are capable of producing it. They seem to be very slightly pathogenic. The infection is found in three forms. Ulcerative, in which the ulcer is generally discoid with an irregular base, and well-marked edges surrounded by a limiting furrow, having little discharge. There is often a halo of infiltration. Sometimes there is hypopyon.

The nodular form simulates a band keratitis but the raised roughness of the lesion, its sharp limitation, and the vessels running from the limbus make the differential diagnosis simple. The infiltrating form without ulceration is very rare.

The effect on the disease of treatment by iodide of potash also is characteristic, and may help in the diagnosis in doubtful cases.

HAROLD GRIMSDALE.

(10) **Panico (Rome).—The effect of pterygia on the refraction of the cornea. (Influenza dei pterigi sulla rifrazione corneale).** *Boll. d'Ocul.*, January, 1933.

(10) It has been generally accepted that a pterygium has a great effect on the corneal curvature, but few authors have investigated the subject with any care. **Panico** has Amsler's photo-keratoscope which gives permanent records of the image reflected from the corneal surface. In this paper several such photographs are given. Panico notes that the pterygium causes flattening of the cornea in the meridian of its insertion, and that the resulting astigmatism varies with the extent of the pterygium; it may be limited to the periphery of the cornea, or may affect the central region. The axis of the astigmatism is usually oblique corresponding to the oblique insertion of the pterygium. When the pterygium is removed the astigmatism diminishes.

HAROLD GRIMSDALE.

(11) **Roberti (Bari).—Corneal sensation and reflex in health and disease. (Sensibilita ed il reflesso corneale nella fisiologia e patologia).** *Ann. di Ottal.*, November, 1932.

(11) **Roberti** gives a short account of the innervation of the cornea showing how the ciliary nerves form various plexuses from which very numerous filaments are sent off, so that division of one branch has no effect in producing localized anaesthesia. Three forms of sensation may be recognised in the cornea, the sensation of touch, of heat and cold, and of pain. Pain is so closely allied to the others in the case of the cornea that some have denied any other form of sensation. Diminution of sensitiveness is always accompanied by loss of reflex, both motor and lacrymatory.

It is uncertain whether corneal sensation is lessened with age. The sensation and the reflexes are disturbed in various forms of nervous disease; local disease of the trigeminal is usually associated with anaesthesia of the cornea and loss of the reflex; in trigeminal neuralgia the sensitivity is often increased. In disease of the central nervous system the relation between sensitivity and the reflex is often disturbed. The reflex may be lost though sensation is preserved. When the corneal sensation on one side is lowered, a general anaesthesia of the whole of that half of the body is often found. This serves to distinguish a central anaesthesia from one due to lesion of the trigeminal.

In certain local disorders the sensitivity is changed; thus in glaucoma, it is constantly reduced. It is clear that this loss has some relation to the increase of intra-ocular pressure, but the mechanism is by no means certain.

HAROLD GRIMSDALE.

(12) **Spitzer, Emma (Vienna).—On the sensitivity of the cornea after certain operations for retinal detachment. (Zur Frage der Hornhautempfindlichkeit nach bestimmten Netzhaut-operationen).** *Arch. f. Ophthal.*, Vol. CXXX, p. 41.

(12) Changes in the sensitivity of the cornea have been studied in connection with the introduction of new anaesthetics, diseases of the eye, general diseases, and after iridectomy and cataract operations. **Spitzer** has extended this investigation to the operations of Guist, Lindner, and Safár's diathermy for detachment of the retina.

She found that after all these operations a disturbance of the sensibility of the cornea occurs in the sector of the cornea corresponding to the field of operation. The loss of sensibility is most extensive after Guist's operation, less with Lindner's, and apparently least after multiple micro-coagulation. This disturbance diminishes in all cases in the course of time.

After Guist's operation distinct signs of regeneration of the sensitivity can be observed in five months, but for complete or almost complete recovery a further period of six months is required. After Lindner's undermining method a distinct improvement begins to show itself in three months; in one case the sensibility was normal after five months. The return of the sensibility appears first in the central portion of the sector affected, and extends from there towards the margin of the cornea. After Guist's operation, as after cataract operations, there are at times great variations from the average, not only in the duration of the disturbance but also in the appearance of small marginal ulcers in the horizontal meridian. These ulcers heal only after a considerable time without any untoward result to the patient. They also occur after the diathermy method. No definite connection between the age of the patient

and the rate of regeneration was observed, although it would seem that in a period of twenty weeks after operation the recovery was more rapid in patients between the ages of 20 and 35 than in those over 50. As regards the site of operation the loss of sensibility was more marked in cases where it was performed on the nasal or temporal side than above or below.

THOS. SNOWBALL.

II.—MISCELLANEOUS

(1) **Weekers, L. and Hubin, R. (Liège).—A contribution to the aetiology of hereditary optic atrophy (Leber's Disease). (Contribution à l'Etiologie de l'Atrophie héréditaire du Nerf Optique (Maladie de Leber).** *Arch. d'Ophtal.*, April, 1933.

(1) The notes in this communication by **Weekers** and **Hubin** relate to what might almost be called an "outbreak" of Leber's disease; the unusual circumstances connected therewith justify its publication. In the opinion of the writers this case "casts a notable light" on the problem of the aetiology of Leber's disease. The reviewer finds it difficult to accept this statement by reason of the absence of evidence concerning the ancestry of the female line. The family to which the males belonged had an accessible history dating from the 14th century. In these archives no trace of an hereditary ocular malady was discoverable.

At a known date three brothers in this family married three sisters. All these three unions were followed by the occurrence of Leber's disease in the offspring; the cases were limited strictly to the male sex.

In the family of the first couple all the males in the first and second generation, four in each, developed the disease, while the females numbering eight, were all unaffected. In the third generation only one male had reached an age of susceptibility; at the age of 25 he was free from symptoms.

The second couple had four children; one male who was the subject of the disease, three females who were exempt. No facts as to the second generation are available.

In the seven children of the third couple the two males were affected, the five females were immune. The second generation comprised thirteen individuals, four males, nine females. Three of the males were the subject of optic atrophy; no information concerning the fourth was obtainable. The females were all unaffected. The information concerning the third and fourth generation of this family is incomplete.

The incidence of the disease in these three families is shown in a genealogical diagram.

J. B. LAWFORD.

(2) **Knapp, Arnold (New York).—Association of sclerosis of the cerebral basal vessels with optic atrophy and cupping.** *Arch. of Ophthal.*, November, 1932.

(10) **Knapp's** paper is based on a series of 10 cases under observation for four years which showed optic atrophy, cupping, central or marginal, and field losses tending to be altitudinal in type. The intra-ocular pressures were normal. X-ray examination showed sclerosis affecting the ophthalmic arteries, optic atrophy being due to this condition. There is some doubt as to mechanism by which optic atrophy is brought about in such cases. The obvious explanation is that it is due to pressure on the nerve by the sclerosed artery and there are three places in which this may occur:—(*1*) In the fibrous optic canal. (*2*) In the falciform dural fold. (*3*) Midway between the canal and the chiasma where the optic nerve is sandwiched between the internal carotid and anterior cerebral arteries. Wilbrand and Saenger, however, believe that the atrophy is due to nutritional disturbances of the optic nerve consequent on the smaller vessels being rendered impervious by sclerosis of their walls.

F. A. W-N.

(3) **Elsberg, Charles A., Hare, Clarence C., Dyke, Cornelius G. (New York).—Unilateral exophthalmos in intracranial tumours with special reference to its occurrence in the meningiomata.** *Surgery, Gynecology and Obstetrics*, December, 1932.

(3) **Elsberg, Hare** and **Dyke** begin their paper with a survey of the literature bearing on this condition which shows that all authors are agreed that increase of intracranial pressure may produce an exophthalmos which may be unilateral or bilateral. In cases where there is direct invasion of the orbit by the tumour, the cause of the proptosis is obvious. The condition can occur, however, apart from orbital wall involvement and in such cases it has been customary to explain it as being due to pressure on the cavernous sinus bringing about venous congestion of the orbital contents, or to paralysis of the recti muscles allowing the globe to come forward. Neither of these explanations is accepted by the authors of this paper, one of the main arguments being the absence of congestion in the retinal veins in cases which did not show papilloedema. The true explanation is probably direct transmission of pressure from the middle cranial fossa, through the superior orbital fissure. In a series of 807 intracranial tumours, unilateral proptosis was found to occur in 15 cases and this was often—for a number of years—the only symptom. The growth which most commonly produced the condition was a meningeal fibro-blastoma which invaded the orbit.

F. A. W-N.

(4) **v. Sántha Kálmán (Budapest).—On the condition of the primary optic centres in unilateral peripheral blindness. (Ueber das Verhalten der primären optischen Zentren bei einseitiger peripherer Blindheit).** *Arch. f. Ophthal.*, Vol. CXXIX, p. 224.

(4) **v. Sántha** examined anatomically the optical system in a male who, through an injury to the optic nerve, had been totally blind in the right eye for thirty-five years, and found in both external geniculate bodies an alternating simple atrophy of the cell laminae, *i.e.*, on the left side an atrophy of all portions of the peripheral layer (the peripheral large cell lamina, the peripheral medium-sized cell layer and its intermediate continuation) with intact central layer, while on the right side the conditions were reversed—intact peripheral laminae, the central atrophied. This shows that the peripheral laminae receive the contralateral optic nerve fibres, the central laminae the homolateral.

These findings confirm those previously put forward by Minkowski, and give further proof of the fact that the optic fibres running back from both eyes have a distinct and separate termination in both primary optic centres, and do not intermingle as has been held by some writers.

The corpus pre-geniculatum on the homolateral side was practically intact, but showed marked changes on the contralateral side. This nucleus the author regards as a primary optic centre like the external geniculate body but differing from it in that it receives only crossed fibres.

The visual cortex showed no definite sign of atrophy on either side.

The author refers in a footnote to a valuable article on the same subject by Le Gros Clark which appeared in this Journal, May, 1932.

THOS. SNOWBALL.

BOOK NOTICES

Reports of the Committee upon the Physiology of Vision. Vol. XII. Colour Vision Requirements in the Royal Navy.

The Reports of Committees of the Medical Research Council which have already been published have established a very high standard. It can be said without hesitation that the report on colour vision in the Navy does not fall short of its predecessors. Throughout its pages the reviewer has been impressed by the evidences of meticulous care and thoroughness in the investigations of matters under consideration: their concise and decisive statements arouse a

suspicion that the Committee have become imbued with the methods of expression characteristic of the Navy.

The preface contains the following paragraph :—"The work was originally undertaken at the request of the Admiralty, and was done with the aid of facilities given in the Royal Navy. On the completion of the report it seemed to the Committee that the results had a wide public interest, transcending the conditions and requirements of the particular service, and that they ought to be made generally available. The Medical Research Council are therefore greatly indebted to the Lords Commissioners of the Admiralty for permitting publication."

We may add that members of the medical profession, generally, will be equally grateful.

The contents of this report are grouped under headings A to H; an Appendix includes a Report of Colour-vision Tests, and the detailed results of the examination of 19 individuals.

In Section B, "General Considerations and Recommendations"; Section C, "Specific Considerations and Recommendations"; and Section G, "Summary and Conclusions"; will be found the salient features of the report and those of greatest interest and assistance to members of the medical profession and others who may be in any way responsible for the detection of defective colour-vision.

That part of the Report which will attract the widest general interest concerns the incidence of defective colour-vision which this investigation has shown to be much higher than the 4 to 5 per cent. (in males) generally accepted hitherto, and which represents the percentages obtained by two earlier Committees in this country, among unselected males.

The Committee's statement is as follows:—"Defective colour-vision is much commoner than is generally supposed. An unselected male population contains at least 4 per cent. of crudely defective persons (dichromats). The anomalous trichromats are considerably more numerous. Six per cent. is a very conservative estimate of the incidence of anomalous trichromatism among some 30,000 naval ratings (a selected population), tested in the course of this investigation. *On the lowest estimate, therefore, more than 10 per cent. of an unselected male population have imperfect colour-vision.*" (The italics are ours).

It is probable that the Committee's estimate of ten per cent. of colour-vision defectives (of all grades) among unselected males, based upon the results of their investigation, may be accepted as substantially correct. It is, however, only an estimate, and has yet to be established as the actual percentage. Further evidence on this question is desirable and could be made available by the examination of a large number of unselected males, by tests and methods of examination exactly similar to those employed by the Committee.

It is probably fair to assume that the noticeably higher proportion of colour-vision defectives recorded by the Committee is partially, perhaps mainly, explained by the greater accuracy and delicacy of the present day tests and methods of examination.

The sections descriptive of the technique of the three tests which the Committee recommend, the Ishihara Test, the Edridge-Green lantern Test and the Board of Trade lantern Test are very explicit: an examiner who studies them with care can scarcely fail to carry out the tests intelligently.

The Committee's emphatic statement that " no single test is infallible " should be taken to heart by all examiners.

Section G. containing the Summary of Conclusions is specific to the Royal Navy and therefore not of particular interest to the average reader, but it will be well to quote the first and second paragraphs. They run as follows:—

1. The existing system of testing colour-vision has failed to exclude seriously defective persons from the Navy.

2. The final examination of the colour-vision of candidates for entry should be undertaken, at the Training Establishments, by ophthalmic surgeons equipped with adequate apparatus. All other examinations should be regarded as provisional, and the candidates should be on probation until they have passed this final test. No lesser reforms will solve the problems presented by the Seaman Branch and ensure the safety of the Service.

The recommendations of a Committee with a personnel of distinguished scientists such as this, merits and will doubtless receive serious consideration by the Admiralty. To carry out the methods of examination which in the opinion of the Committee are essential, will prove a difficult task for the Medical Department of the Royal Navy in its present under-staffed condition. But that they will tackle it, as the Navy always tackles difficulties, is not open to doubt.

Miners' Nystagmus: its Symptoms, Aetiology, and Treatment. By F. O'SULLIVAN, M.B., Ch.B., B.A.O. Pp. 97. Plates, 2. Bristol: John Wright and Sons. 1933. Price, 5s.

The author introduces his subject by giving an account of the main features in the differential diagnosis of nystagmus and a brief description of diseases such as disseminated sclerosis, Friedreich's ataxia, lesions of the cerebellum and semi-circular canals, congenital nystagmus, total colour blindness and albinism.

An account is given of the conditions under which miners work, and the relatively high incidence of nystagmus in men working in poor illumination, such as the colliers, repairers and timbermen is commented on.

A chapter is devoted to the symptons and physical signs accompanying this disorder, and the author classifies the cases into atonic, spastic and psychic. The aetiology is discussed in regard to the position of the miner at work; defective illumination; certain colliery factors such as the age of the pit, the carbon and hydrogen ratio and the percentage of volatile matter; hereditary pre-disposition; the toxic effects of alcohol and tobacco; focal sepsis; refractive errors; accidents; the absence of sunlight and ultra-violet rays; deficiency in haemoglobin and vitamin and occupational neurosis.

Recommendations are made for the treatment of miners' nystagmus and its allied disorders of headache, vertigo, insomnia, constipation, conjunctivitis and neurasthenia. Notes of 50 cases are reported, and there is a bibliography and an index.

The author feels that by raising the standards of physical fitness and improving the lighting system, miners' nystagmus will eventually be eliminated from the mining industry.

This book is full of interesting observations and reflections.

Chronic Nasal Sinusitis and its Relation to General Medicine. By PATRICK WATSON-WILLIAMS. Second Edition. Pp. 252. Illustrations, 122. Bristol: John Wright and Sons. 1933. Price, 15s.

This monograph contains an account of the pathogenesis of the systemic toxaemias and secondary infections of chronic nasal sinusitis. The need for diagnostic precision is emphasized, and the method recommended is that of the author's suction-exploration technique. There are chapters on sinusitis in children and familial infection; sinusitis as a factor in producing diseases of the respiratory, gastro-intestinal and genito-urinary tracts, and in the aetiology of cardiac, arthritic and skin infections. A chapter is devoted to orbito-ocular affections of rhinogenous origin. The clinical features of these affections are described, and particular attention is paid to cases of retrobulbar neuritis associated with infection in the sphenoidal and posterior ethmoidal sinuses. The author stresses the importance of prompt diagnostic methods to determine the site of intra-nasal infection in these cases. He uses a cannula for puncturing the wall of the suspected sinus and withdrawing its contents for pathological examination. He points out the necessity for recognizing morphological abnormalities of sinuses, and quotes two interesting cases where one sphenoidal sinus was large and extended across both sides of the mid-line, and the other was small, the cavity of which was entered after first puncturing the large sinus and then turning the cannula laterally and making a second puncture. Infection in the small sinus, which was in close relation to one optic nerve might have been missed if this anatomical defect had not been realised.

Reports on the visual field changes in retro-bulbar neuritis and case notes illustrating certain important features are given.

Some principles of treatment are dealt with and pernasal and external operations described.

This book is well produced and the illustrations excellent. The author is to be congratulated on making an important link between rhinology, general medicine and ophthalmology where chronic nasal sinusitis is concerned.

Collected Reprints from the Wilmer Ophthalmological Institute of the Johns Hopkins' University and Hospital. Vol. III, Baltimore. 1932-1933.

This handsome volume contains reprints of 65 papers which have been published from the Wilmer Institute in various journals; and the members of the staff of the Institute take the opportunity of its appearance coinciding with Dr. Wilmer's 70th birthday, to offer affectionate greetings to their Director. With such a wealth of material, it is not of course possible within the limits of a short notice to give a detailed list of the contents; but we may say that the volume is worthy of the great Institute from which it has sprung; and contains evidence of work in physics, physiology, clinical ophthalmology, immunology and ancillary subjects. Perhaps the most interesting paper of them all is that on Milton's blindness by Dr. Wilmer. He is able to disprove the albino question once and for all by the reproduction of a portrait of Milton as a boy, which is in Mr. Pierpont Morgan's collection. Dr. Wilmer inclines to chronic glaucoma as the cause of the blindness, but admits that myopia complicated by detachment has claims for consideration.

CORRESPONDENCE

THE CILIARY MUSCLE AND DESCEMET'S MEMBRANE

To the Editors of THE BRITISH JOURNAL OF OPHTHALMOLOGY.

SIRS,—May I suggest that a study of Comparative Anatomy disproves Mr. de Villiers' conclusions in his recent article on the Ciliary Muscle and Descemet's Membrane?

In a demonstration of the comparative anatomy of the angle of the anterior chamber in man and monkeys *(Trans. Ophthal. Soc.*

U.K., Vol. XLI), and also in an article on the Anatomy and Physiology of Accommodation in Mammalia (*Trans. Ophthal. Soc. U.K.*, Vol. XLVI), will be found ample evidence to refute every one of his reasons for the conclusion that from its nature, structure, position, etc., etc., Descemet's Membrane should be regarded as an anterior tendon of the Ciliary Muscle.

Yours faithfully,

THOMSON HENDERSON.

NOTTINGHAM.
December 2, 1933.

THREADING OF NEEDLES

To the Editors of THE BRITISH JOURNAL OF OPHTHALMOLOGY.

SIRS,—The threading of number one plaited advancement silk on a number four curved needle requires some dexterity, especially after the silk has been boiled or during an operation. But by a method described by Dr. Poth, of San Francisco, in the *Jl. Amer. Med. Assoc.* (February 25, 1933), the matter becomes simplicity itself. The original description is modified to suit the ophthalmic surgeon.

Take a piece of wire used for keeping patent the needle of a hypodermic syringe. Make it into a loop and grasp the two ends with an artery forceps. Pass a piece of silk through the loop and pull tight to shape the end of the wire so that it will readily pass through the eye of the needle. Remove the silk and pass the doubled wire through the eye of the needle or through the eyes of the several needles. Pass the silk through the loop of the wire and draw it through the needle or needles, thus threading them. The silk then can be cut into proper lengths.

If a wire loop as described is available on the instrument table, with a needle threaded, a suture which has broken between the muscle and the needle can be instantly rethreaded.

Yours truly,

A. F. MACCALLAN.

OBITUARY

DR. ERNEST E. MADDOX

BY the death of Dr. Ernest Edmund Maddox which occurred on November 4, at his home in Bournemouth, British Ophthalmology has lost one of its most distinguished ornaments and ablest exponents.

Dr. Maddox, who was educated at Mill Hill School and the University of Edinburgh, was the son of Mr. J. F. Maddox, of Shipton, Oxfordshire, and graduated M.B., C.M. in 1882, M.D. in 1889, and F.R.C.S.E. in 1894.

As a student he distinguished himself by gaining the "first medal of his year in physiology," and the "Primary Fellowship of the College of Surgeons of England," and after qualifying, the Syme Surgical Fellowship for his work on the "Accommodation and Convergence of the Eyes." These successes were but a faint indication of the excellent work and distinguished career that were to follow.

His early professional life (for he decided to devote himself to eyes) was spent in Edinburgh, where he practised for about ten years during which time after being resident physician he held the appointments of Assistant Ophthalmic Surgeon and University Ophthalmoscopic Tutor. During these years he was associated with Argyll Robertson and Berry, and not only increased his reputation as a teacher, but also as an operator.

After a long period of ill-health he left Edinburgh, and owing to his association with the late Dr. Roberts-Thomson of Bournemouth, he was given the appointment of Ophthalmic Surgeon to the Royal Victoria Hospital, Bournemouth, and later that of the Royal Boscombe and West Hants. Hospital, which appointments he held for many years until he retired from hospital work altogether.

The greater part of his brilliant work was done in that town, where he laboured until the time of his death, unceasingly, for the good and welfare of his patients.

Dr. Maddox wrote extensively, and all his communications were marked by outstanding merit, and bore the stamp of a master mind.

As an author (in the writer's opinion) he excelled in originality, clarity of thought and expression, and he had the ability of making deep and obscure things clear, even to the uninitiated.

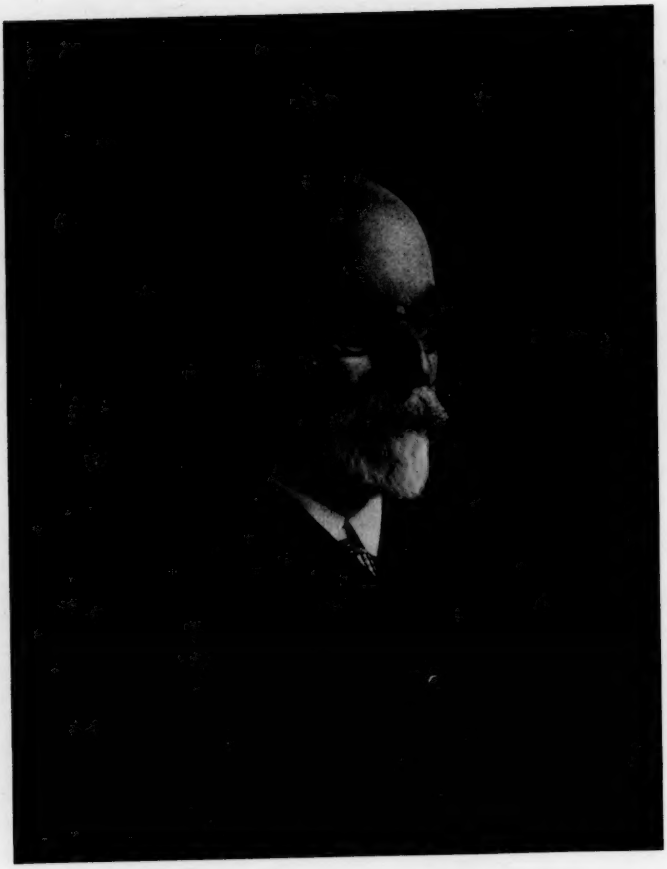
While he could teach well it was not his strong point; he was primarily and essentially an investigator and was constantly in pursuit of new and fresh methods in connection with his work. Anything original delighted him immensely and he was most punctilious as to giving honour where that was due. The writer well remembers his delight on the discovery that in the pendulum

lay the geometrical and mathematical explanation of the fact that two crossed cylinders make a sphere spherical.

He was so well informed himself that he could not tolerate ignorance in those around him, and to discuss anything with him one had to be at home in all the essentials and what was to be be known in order to start.

He was an excellent critic because he was so well informed and his judgment was always good and just and his advice worth having, and it was always given sympathetically. All his writings were marked by thoroughness which was the outcome of a complete mastery of the subject. For his book, "Tests and Studies of the Ocular Muscles," the writer knows that he read practically all the original work on the brain that was available at the time. The mutual pleasure derived from the study of Bruce's work on the mid and hind brain preliminary to a contemplated revision of his book is still very vivid in the writer's recollection. Of his outstanding works may be mentioned his book on the "Clinical Use of Prisms and the Decentering of Lenses," which went into the fifth edition, and is a work of reference. The originality of his teaching could easily be seen in this book where he drew attention to the treatment of the anomalies of the extrinsic muscles of the eye. His ocular demonstration of points made through the medium of geometrical methods were most ingenious and all he advocated there has been most generally accepted. His Tests and Studies of the Ocular Muscles was edited both in America and Germany and was a level-headed presentation of the subject; his "Golden Rules of Refraction" (an exceedingly clever little book) went to a third edition. He was an excellent refractionist and was one, if not the first, to use the Jackson Cross Cylinder in this country, as a quantitative test for astigmatism. He took the greatest pains with his refraction work and it was rarely one could trip him up in an axis determination. Among his other contributions of note early in his career was a paper on the Relation between the Convergence and Accommodation of the Eyes published in the Journal of Anatomy and Physiology; his article on Refraction in the *Encyclopaedia Medica*, and one on the Ocular Muscles in Latham and English's "System of Treatment." He was the greatest living authority on the Phorias; his contribution in the discussion at the Ophthalmological Society and also his Doyne lecture in 1921 (before the Oxford Ophthalmological Congress) on Heterophoria, were masterly.

He was a student all his life, and the above by no means exhausts the valuable contributions that came from his pen. There were few meetings of any standing at which he was not to be seen contributing papers or taking some part in the procedure, or showing instruments or apparatus, for he was an inventor of no mean order;



DR. ERNEST E. MADDOX

in this connection one can mention the "Maddox rod," his cylinder axis finder, his double prism, eye heaters, cataract needles, wing test, his method of photographing the corneal reflex in squint; his "V" test for astigmatism, and later his cheiroscope, a device whereby the eye of a squinting child (amblyopic from disuse) is educated by a method which excites the child's own interest. The patient being caused to make a conscious effort with the hand while the brain is unconsciously educated to perceive the image thrown on the retina by means of the effort. All his things were good and useful. He was a most brilliant operator, and in the different operations for cataract he was probably seen at his best. He was especially fond of extraction in the capsule and his results in this operation were phenomenally good. His delicacy of touch and his capability of rising to any operative emergency showed what a great exponent he was of his craft. This skill he maintained to the end.

He was interested in everything scientific and one of his latest discoveries published in the *Brit. Jl. of Ophthal.* in March, 1933, was the effect of high frequency currents in lowering the tension of hyper-tense eyes and suitable cases of chronic glaucoma.

He was fond of astronomy and his interest in this department of science led to the invention of his "starfinder," a useful little appliance for the teaching of astronomy, and by which the merest tyro could find any particular constellation or star. All his equipment was marked by originality and ingenuity and his consulting room was a veritable treasure house of knowledge. One always learned something from a visit to him.

A few hours before he entered the nursing home he was more concerned with the removal of an eye by some new method that he had adopted than the ordeal he had so soon to undergo. He worked to the last hour. His qualities were so many and admirable that it is difficult to enumerate and assess them.

He was not only well known in this country but his position in Ophthalmology was widely recognised and his reputation was world-wide. One of the safest testimonies was the frequency with which his counsel and opinion was sought by Ophthalmologists far and near. It is safe to say, and the writer speaks from experience, that there is no one whose memory will be held with more regard and esteem by the Ophthalmological branch of the profession all over the world than that of Maddox.

He was an inveterate worker and his work was not done so much for himself as for Ophthalmology and British Ophthalmology in particular, and both owe a deep indebtedness to him.

His work towards the end was largely concerned with the orthoptic training of squint in children. Its commencement here, in this country, and the Clinics which are now established for this work in different parts of the country owe their origin, primarily, to him.

Among his distinguished honours one may mention the "Middlemore Prize of the British Medical Association," given for the best contributions to Ophthalmology during the three years ending 1899; this he obtained for his Tests and Studies of the Ocular Muscles to which we have already alluded; the "Doyne Memorial Medal of the Oxford Ophthalmological Congress" in 1921, for his contributions on Heterophoria.

He was at different times a member of the Council and Vice-President of the Ophthalmological Society of the United Kingdom, and President of the Ophthalmic Section of the British Medical Association, at its meeting held in Eastbourne in 1931, and was to have been President at the Meeting in Bournemouth, in 1934. He was a corresponding member of the "Société française d'Ophtalmologie."

Dr. Maddox married, in 1893, Grace Rivers, daughter of Alexander Monteath, C.S.I., of the Broich and Duchally, Perthshire, by whom he had a large family, and to whom the sympathy of Ophthalmologists all over the World is extended.

J. BURDON COOPER.

T. H. BICKERTON

IT is with great regret that we announce the death on November 23, 1933, of Mr. Thomas Herbert Bickerton, the doyen of ophthalmology in the North of England. His whole working life was passed in Liverpool, of which great city he was a leading citizen; and although he retired from practice some years ago and had settled in the South of England, he returned to his native place about three years ago after the death of his wife, and spent the last years of his life in his beloved Liverpool.

Mr. Bickerton was born in 1857. His father, Thomas Bickerton, was a Liverpool surgeon, who practised in diseases of the nose and throat as well as in ophthalmology. He died while the subject of our memoir was in his teens. Educated at the Liverpool Institute and Royal Infirmary, the son completed his medical education at the London Hospital and took the M.R.C.S.Eng. in 1879. After having held the post of House Surgeon at the Liverpool Royal Infirmary, he became clinical assistant at Moorfields and later took a post-graduate course at Vienna. He was thus peculiarly well fitted to specialise in ophthalmology on his return to England. He joined Mr. Shadford Walker (first as assistant and later as partner), who at that time was the senior ophthalmic surgeon in Liverpool. In 1886 he was elected ophthalmic surgeon to the Liverpool Royal Infirmary, of which institution he was President in 1923. But besides his work in Liverpool itself he was connected with numerous other Hospitals in a consulting capacity. He conducted a very large practice and was a popular and highly respected surgeon.

Mr. Bickerton became a life member of the Ophthalmological Society in 1881 and contributed a number of papers to the *Transactions*. It was curious that his communications to the Society came in spasms. The index in Vol. X does not record any papers by him; but that of Vol. XX, gives six papers. The next ten years again are blank, and the index of Vol. XL shows seven papers from his pen. His most important communication was read at the annual meeting of the British Medical Association in Glasgow in 1888. It dealt with colour blindness in relation to accidents at sea, a subject to which he constantly returned, and on which he was a recognized authority. He was a vigorous critic of apathy of the Board of Trade at this date in these matters; and it is not too much to say that his criticisms, endorsed as they were by Nettleship and Argyll Robertson, were responsible for the great improvements that have taken place. Mr. Bickerton was one of the prime movers in the foundation of Liverpool University; of which he held the degree of Ch.M. *honoris causa*, and where he was lecturer in ophthalmology from 1917-1926.

But his work was by no means limited to ophthalmology. He was a great collector of material for a medical history of Liverpool, and it is hoped that this will be published in the near future. In his younger days he was a keen horseman and a first-class shot. His eminence was still further recognised when, in 1926, he was elected to the Fellowship of the Royal College of Surgeons. He was a Justice of the Peace for his native city and took a keen interest in the cause of temperance.

Col. R. E. Bickerton, D.S.O., his half-brother, is surgeon to St. Dunstan's and late honorary surgeon to H.M. the King; while of his two sons, one is an ophthalmic surgeon in Liverpool and the other ophthalmic surgeon to King's College Hospital, London. His sisters were married to the late Prof. Rushton Parker, of Liverpool, and the late Dr. L. Webster Fox, of Philadelphia.

Mr. Harold Grimsdale writes:—

BICKERTON was known to many generations of students in Liverpool; his long connection with the Royal Infirmary, and his lectureship on ophthalmology at the University of Liverpool had brought him into touch with many of the younger men who attended his clinic and listened to his able and interesting teaching. His professional life in the City extended almost to fifty years. Perhaps his most important work both as an ophthalmic surgeon and as a good citizen, was on colour blindness, especially in connection with the mercantile marine; it was largely due to Bickerton's perseverance that Parliament came to legislate in this matter. In private life, Bickerton was a keen supporter of total abstinence and

for many years he delivered lectures for one or other of the Temperance Societies. He was a great admirer of Meissonier's etchings and at one time possessed a fine collection thereof.

DR. ALFRED OSBORNE

DR. ALFRED OSBORNE died at his residence in Alexandria, on November 15, at the age of 68 years. He was the senior ophthalmic practitioner of Egypt, an active member and a previous President of the Archaeological Society, and was as well known to Egyptians as to the British and other European communities of Alexandria.

Dr. Osborne was a descendant of an old Scottish family, and his ancestors settled in Prague, 150 years ago. Thus he performed his military service in the old Austro-Hungarian Army and received an excellent medical and ophthalmological training in the clinics of the late Duke Carl Theodor of Bavaria, the "princely oculist" and father of Her Majesty the Queen of the Belgians.

After a scientific journey in Asia Minor, Dr. Osborne arrived in Alexandria, in 1895, as successor to Dr. Tachau, a famous ophthalmic surgeon, and took charge of the eye section of the European Hospital. Under Osborne's guidance this section developed enormously and eventually contained over 70 beds for in-patients and hundreds of operations were performed every year. The number of out-patients receiving treatment at the clinic was over 4,000 a year. He remained in charge of the eye section for twenty years. On the outbreak of war he returned to Europe and lived in Germany until 1921, when he returned to Alexandria but only to resume private practice.

Osborne was an excellent physician, a skilled surgeon and a fervent member of the Ophthalmological Society of Egypt of which in 1902 he was one of the founders. In 1903, on his advice a donation by Sir Ernest Cassel, of £40,000, for ophthalmic purposes was utilised in the equipment and maintenance of two travelling clinics for the treatment of eye diseases, the first of their kind in the country. Now thanks to the enthusiasm of MacCallan, Shahine Pasha and their collaborators there are over fifty clinics, most of them in specially built hospitals, throughout Egypt.

Osborne's great work in fighting the epidemic eye diseases of this country is beyond praise and tens of thousands of sufferers have been cured by his skilful hands. He further found time to write many scientific publications of no inconsiderable value to medicine.

Osborne was a connoiseur of German literature, especially of Goethe, and a great admirer of classic art. He leaves a fine and valuable library and an excellent collection of Graeco-Roman antiquities. His sincere and honest character as well as his happy family life won him the regard and friendship of everybody who knew him and his friends will not forget him.

MAX MEYERHOF.

NOTES

Corrigenda

IN Walls and Judd's paper in the November 1933 issue, the following corrections should be made:—

P. 665, l. 10: for "(5800)" read "(λ5800)."
P. 671, l. 5: for "filters" read "rays."
P. 673, l. 7 of footnote 33, for
"(*i.e.*, orange screen)." read
"(*i.e.*, orange) screen."

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Royal London Ophthalmic Hospital

THE Annual Dinner of Past and Present Students of the Royal London Ophthalmic Hospital will be held at the Langham Hotel, Portland Place, on Thursday, February 8, 1934, at 7 for 7.30 o'clock. ***Chairman:*** Elmore W. Brewerton, Esq., F.R.C.S. Tickets (excluding wine) 15/-. An early reply is requested to Mr. P. G. Doyne, 60, Queen Anne Street, W.1. Great inconvenience will be avoided if remittance accompanies application. ***Secretaries:*** Charles Goulden, 89, Harley Street, W.1; P. G. Doyne, 60, Queen Anne Street, W.1.

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Hunterian Lecture

MR. ARNOLD SORSBY will give a Hunterian Lecture, on Retinal Abiotrophy, at the Royal College of Surgeons, on Monday, January 29, at 5 p.m.

FUTURE ARRANGEMENTS

1934

January 12.—Section of Ophthalmology, Royal Society of Medicine.
February 2.—Midland Ophthalmological Society, at Leicester.
February 9.—Section of Ophthalmology, Royal Society of Medicine.
February 16.—North of England Ophthalmological Society, at Newcastle-on-Tyne.
March 9.—Section of Ophthalmology, Royal Society of Medicine. (Clinical Meeting.)
March 16.—North of England Ophthalmological Society, at Liverpool.
April 13.—North of England Ophthalmological Society, at Sheffield.
May 11.—Joint Meeting of the Midland and North of England Ophthalmological Societies, at Nottingham.
June 5.—Midland Ophthalmological Society, at Northampton.

June 8.—Section of Ophthalmology, Royal Society of Medicine. (Annual.)
July 4-7.—Oxford Ophthalmological Congress, at Oxford.
October 2.—Midland Ophthalmological Society, at Birmingham. (Annual Meeting)

CONTEMPORARY OPHTHALMIC LITERATURE

American Journal of Ophthalmology. *November, 1933.*

BEDELL. Some remarks on the aetiology of cataracts.
WOODS and BURKY. The possible influence of immunological factors in the production of cataract.
JULIANELLE, MORRIS and HARRISON. An experimental study of corneal vascularization.
JACKSON. Changes in astigmatism.
THEOBALD. The use of calcium gluconate in diseases of the eye.
ALVIS and WIENER. Very high astigmatism in keratoconus and post-cataract cases.
SAUERMANN. Contribution to the problem of enzyme-action in the mechanism of cataract.

Archives of Ophthalmology. *November, 1933.*

WHITE. Indications for treatment for combined lateral and vertical strabismus.
VAIL. Mixed (teratoid) tumours of the lacrymal caruncle.
AEBLI. Retraction syndrome.
TERRY and DUNPHY. Metastatic carcinoma in both optic nerves simulating retrobulbar neuritis.
BRUCE. Visualization of foreign bodies in the iridocorneal angle: a simple method of stereoscopic gonioscopy.
POSEY and CARRIS. National Society for the Prevention of Blindness: a lay movement for the conservation of vision.
KRAUSE. Chemistry of the lens: III. Autolysis of the lenticular proteins.
VERHOEFF. Effect of stereopsis produced by disparate retinal images of different luminosities.
KRONFELD. Function of the re-attached retina.
BEIGELMAN. Actinomycosis of the orbit.
DILLON and GREER. Use of nupercaine in ophthalmology.

Annales d'Oculistique. *November, 1933.*

WEILL. *L'interférométrie* in the diagnosis of tuberculous irido-cyclitis.
——— Clinical results of *l'interférométrie* in ophthalmology.
KAPUSCINSKI. On retinal detachment with remarks on the mechanism of the movements of the inside of the globe.
SÉDAN. On the importance of the tension of sub-retinal fluid in the development of certain cases of retinal detachment.
RUBBRECHT. Some remarks on Toti's operation.

Archives d'Ophtalmologie. *November, 1933.*

BONNET. Angioid streaks in the retina.
WEEKERS and HUBIN. Haemorrhagic neuro-retinitis of dental origin.
LAZARESCU, E. and LAZARESCU, D. Three cases of coloboma of the ocular membranes.

Revue d'Oto-Neuro-Ophtalmologie. *September-October, 1933.*

COLLET. Zosteriform palatine eruption preceded by contra-lateral neuralgia.
PORTMANN and DESPONS. Two cases of cephalic zoster.
SÉDAN. Low intra-ocular pressure in cephalic zoster.

Klinische Monatsblätter für Augenheilkunde. *November, 1933.*

COMBERG. A new slit-lamp.
VELHAGEN, Jun. Our localization perimeter.
KAYSER. Deep peripheral excavation without glaucoma.
HAGER. Treatment of familial corneal degeneration.
MERRILL. Rare ophthalmoscopic conditions in sarcoma of the choroid.
HILLSCHER. A contribution to illustrative cases of lightning cataract.
BROCKMEYER. A case of dysostosis craniofacialis.
JABLONSKI. Short communication on an atypical fundus.
HESSE. Gonorrhoeal choroiditis?
REITSCH. The peculiar features of pseudo-papilloma of the lateral canthus.
DALLOS. About contact glasses.
CSILLAG. An acute case of glaucoma treated by cyclodialysis.

Zeitschrift für Augenheilkunde. *November, 1933.*

HEINE. The question of operating for injuries due to accidents with particular consideration for the subsequent damage to the eye.
ZEITLER. The clinical features of epibulbar tumours.
JOHN. Parenchymatous keratitis and saddle nose.
KYRIELEIS. Fundus changes in diseased conditions of the blood.
JESSEL. Intra-orbital tumours, clinical and therapeutic contribution.

Archiv für Ophthalmologie.

FRIEDE. Comparative studies on the size of animal and human corneae with particular regard to human megalocornea.
KLEIN. Contribution to the knowledge of the absorption of eye ointments. III. Communication. The absorption of homatropine, pilocarpine and eserine.
v. PAPOLCZY. On the clinical features, pathology and treatment of epibulbar squamous epithelial carcinoma.
KREIBIG. Plasmocytoma of the conjunctiva.
SACHA. Dimmer's nummular keratitis.
OHM. Nystagmus.
GRIMM. On the possibility of unequal binocular accommodation, and on the nature of accommodation.
MAJOROS. The post-mortem changes of the aqueous humour.

Annali di Ottalmologia e Clinica Oculistica. *September, 1933.*

BIFFIS and QUAGLIO. Experimental research on lenticular antigen therapy.
SCALINCI. The merits of Antonio Scarpa in the field of ophthalmology.
SANTONASTASO. Chiasmal syndrome and affection of the sellar region.
ATTIMONELLI. Ametropia in the primary school at Bari.

Bollettino d'Oculistica. *October, 1933.*

ARRUGA. Treatment of epiphora by means of Toti's operation.
FOCOSI. Notes on a neuroma of the orbit.
BELLORA. On occlusion of the central retinal artery. Some notes concerning a case of embolic obstruction of the central retinal artery with partial macular recovery and extra-papillary arterial anastomosis.

ORZALESI. Primary basal-celled carcinoma of the bulbar conjunctiva.
GALEAZZI. Further notes on a case of retinitis circinata.
BALCET. Weight, diameter and volume of the lens in relation to the age and weight of the animal.
HESKY. Two further clinical observations on the spherical formation and bilateral symmetry of the vitreous body.

Rassegna Italiana d'Ottalmologia. *November, 1933.*

PASCHEFF. Multi-pustular conjunctivitis.
VENCO. Research on "lysozyme" in tears.
CORRADO. "Naevus flammeus" and glaucoma.
MARCHESINI. On the morphology of the sphenoidal sinus and the optical canal studied by transillumination.
PICCALUGA. On "Ulcus rodens" or Mooren's ulcer.
LUMBROSO. About three cases of metastatic endophthalmitis.
BIONDO. Ocular lesions from bitumen.

Revista Oto-Neuro-Oftalmologica e Radio-Neuro Chirurgica.

July-August, 1933.

POPPI. The oculo-motor tract.
LUGLI. Ocular lesions in serous meningitis.
DEL DUCA. Speculative notes on the pathogenesis of papillo-retinal lesions in pernicious anaemia and in leukaemia.

Archivos de Oftalmologia Hispano-Americanos. *November, 1933.*

SATANOWSKY. Partial cryptophthalmos with epicanthus and congenital ptosis of the upper eyelid.
MOREU. Considerations on the pathogenesis and treatment of pigmentary degeneration of the retina.
MARQUEZ. Controversial points respecting the pathogenesis and treatment of retinal detachment.
ARROYD DE MARQUEZ. Notes on the diagnosis and treatment of ocular tuberculosis.

Revista Oto-Neuro-Oftalmologica. *Sepember, 1933.*

MENDOZA. Stereoscopy without the stereoscope.
PAVÍA. Bilateral juxta-papillary chorio-retinitis.
——— Lesions of a green colour in the fundus. New observations.

Revista Oto-Neuro-Oftalmologica y de Cirurgica Neurologica.

November, 1933.

FRANCESCHETTI. Corneal sensibility.
PAVIA. The correction of strabismus with the miocampter.
DUSSELDORP and RIVOLTA. Changes of postural tension in the central retinal artery.
PAVIA and DURANDO. Sub-retinal cysticercus.